

2010

# EIGHT YEARS OF UBIQUITOUS TECHNOLOGY ACCESS AND DIGITAL CURRICULA: BUSINESS AND MARKETING HIGH SCHOOL TEACHERS' PERSPECTIVE

Eckert Mary

*Virginia Commonwealth University*

Follow this and additional works at: <http://scholarscompass.vcu.edu/etd>

 Part of the [Educational Leadership Commons](#)

© The Author

---

Downloaded from

<http://scholarscompass.vcu.edu/etd/2333>

This Dissertation is brought to you for free and open access by the Graduate School at VCU Scholars Compass. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of VCU Scholars Compass. For more information, please contact [libcompass@vcu.edu](mailto:libcompass@vcu.edu).

© Mary Theresa Eckert 2010  
All Rights Reserved

EIGHT YEARS OF UBIQUITOUS TECHNOLOGY ACCESS AND DIGITAL CURRICULA:  
BUSINESS AND MARKETING HIGH SCHOOL TEACHERS' PERSPECTIVE.

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of  
Philosophy at Virginia Commonwealth University.

by

Mary Theresa Eckert  
B.S., Old Dominion University, 1977  
M.Ed., Virginia Commonwealth University, 2005

Director: Jonathan D. Becker, J.D., Ph.D.,  
Assistant Professor, Department of Educational Leadership  
School of Education

Virginia Commonwealth University  
Richmond, Virginia  
December, 2010

## ACKNOWLEDGMENT

The author wishes to thank several people. I would like to thank my husband, Ted, for his undying love, support and patience during this arduous, all-consuming process. Without his encouragement and laser-focus keeping me on track, I would not have had the courage to persevere. To my sons, Rocky and Jonathan, Jr., I thank you for believing in me. Thank you to Sharon Gibson and Barb Hancock-Henley whose humor, kindness and friendship made my professional life bearable. Thank you to all of the VCU professors whose critical eyes helped me to see more clearly. Thank you to my cohort members who adopted Dr. Triscari's mantra of "Leave no student behind." Thank you to *all* the outstanding business and marketing teacher-heroes with whom I have had the privilege to work. Their dedication to the teaching profession humbles me daily. To my committee members Drs. Terry Carter, Gary Sarkozi, and Britt Watwood; thank you for your kind consideration and thoughtful guidance. Finally, thank you Dr. Jonathan Becker for all your help, patience, insight, wisdom, and direction.

@CTE\_PhDiva

Thanx 2 EWE, Rocky, JonnyMac, my BFFs, my teacher-peeps, & the VCU Docs. I went FTW!

## TABLE OF CONTENTS

	Page
LIST OF TABLES .....	vi
LIST OF FIGURES .....	vii
ABSTRACT .....	viii
 1. INTRODUCTION .....	 1
Statement of the Problem .....	2
Rationale for Study of Problem .....	2
Literature/Research Background .....	3
Research Questions .....	5
Methodology .....	5
Findings and Conclusions .....	6
Summary .....	6
 2. LITERATURE REVIEW .....	 8
From Vocational Education to Career and Technical Education .....	9
Twenty-first Century Skills .....	18
A Brief History of Technology in Education .....	20
The Effect of Technology on Education .....	22
Ubiquitous Technology: A New Policy Frontier .....	24
Technology Initiatives .....	26
The iBook Teaching and Learning Initiative .....	29
 3. DESIGN AND METHODOLOGY .....	 33
Research Design .....	33
Setting of the Study .....	35
Participants .....	37
Data Collection .....	39
Phase 1. Electronic Survey .....	39
Phase 2. Observations and Artifacts .....	43

	Page
Phase 3. Focus Group .....	44
Data Analysis .....	46
Assurance of Confidentiality.....	49
Steps to Ensure Reliability and Trustworthiness .....	50
Limitations .....	52
Discussion .....	53
Definition of Key Terms .....	54
4. PRESENTATION OF FINDINGS .....	62
Quantitative Strand, Phase 1: Electronic Survey Analysis .....	63
Qualitative Strand, Phase 2: Classroom Observation and Artifact Data Analysis....	77
Artifact Data.....	90
Qualitative Strand, Phase 3: Results: Focus Group Analyses.....	93
Theme 1. Instruction .....	94
Theme 2. Challenges.....	104
5. IMPLICATIONS AND CONCLUSIONS.....	114
Challenges .....	120
Conclusions .....	123
New Understandings.....	124
Strengths and Limitations .....	124
Strengths .....	125
Limitations .....	125
Recommendations for Future Research .....	126
Summary .....	126
LIST OF REFERENCES .....	129
APPENDIXES	
A. The Technology Integration Progression Chart .....	144
B. Participant Letter .....	146
C. Participants' Professional Profiles .....	147
D. Survey .....	154
E. Participants' Perception of Their Technology Integration Level Based on The Technology Integration Progression Chart .....	158
F. Observation Form .....	162
G. Permission to Conduct Research.....	163
H. Teacher Informed Consent Agreement .....	164
VITA .....	167

## LIST OF TABLES

Table	Page
1. Participants' Age Range Demographics and Percentages .....	38
2. Participants' Best Description of Subjects Taught .....	41
3. TIPC Standard and Corresponding Online Survey Statements .....	43
4. Teacher's Artifact Collection Log .....	45
5. Participants' Demographics and Professional Profile.....	64
6. Eighteen Participants' Perceived Levels of Technology Integration and Use...	74
7. The Number and Percent of Technology Used Based on 18 Participants and 72 Observations .....	77
8. The Number and Percentage of Time Participants Reached a Level of Technology Integration .....	83
9. The Teachers With Access to, Use, and Trained on a Particular Technology...	85
10. Observations in Rooms With Desktop Computers .....	86
11. Observations in Rooms Without Desktop Computers .....	87
12. Observations of Use of LCD Projector Beam.....	88
13. The Number and Percent of Technology-based Artifacts Collected .....	90
14. Theme 1. Instruction: Core Categories and Supporting Qualitative Data .....	93
15. Theme 2. Challenges: Core Categories and Supporting Qualitative Data.....	94

## LIST OF FIGURES

Figure	Page
1. Participants' Perceived Level of Organization of Learning Space .....	66
2. Participants' Perceived Level of Equipment Use for Teaching.....	67
3. Participants' Perceived Level of Their Digital Organization .....	68
4. Participants' Perceived Level of Digital Content Delivery and Resources .....	69
5. Electronic Resources Used for Instruction .....	70
6. Electronic Resources Used for Assessment.....	71
7. Support of Student-centered Learning .....	72
8. The Number of Times Participants Reached a Level of Technology Integration .....	84



## ABSTRACT

### EIGHT YEARS OF UBIQUITOUS TECHNOLOGY ACCESS AND DIGITAL CURRICULA: BUSINESS AND MARKETING HIGH SCHOOL TEACHERS' PERSPECTIVE

By Mary Theresa Eckert

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

Virginia Commonwealth University, 2010.

Major Director: Jonathan D. Becker, J.D., Ph.D.,  
Assistant Professor, Educational Leadership  
School of Education

This research was conducted during the 2009-2010 school term as a case study of a large school division's technology initiative after eight years to chronicle its effect on high school business and marketing teachers' use and integration of technology. The 18 teachers were business and marketing teachers from eight high schools, two technical centers and one alternative school who participated in the one-to-one laptop initiative from its inception and who were asked to participate in the study. A web-based survey on technology use and adoption was administered to 18 high school business and marketing teachers. The researcher conducted a total of four unannounced observations of each teacher's instruction, specifically for technology use, by using the Instructional Technology Resource Teachers' Technology Integration form. Additionally, the teachers were asked to participate in one of two focus group interviews to determine their level of technology use along with their perceptions regarding the technology

initiative and its effect on their instruction and teaching strategies. This case study has relevance to school districts with technology initiatives or districts considering adopting one. The high school business and marketing teachers' vantage point provided unique information about the effect a one-to-one laptop initiative has made on business and marketing teachers' technology use over the last eight years.

The effect that a comprehensive, one-to-one initiative had on business and marketing high school teachers' technology use was twofold. First, instruction was affected. Teachers and students were found to manage data electronically, the amount of and methods for teachers' communication changed, and exemplars surfaced. Second, challenges emerged. Teachers' classroom management responsibilities included laptop monitoring, access issues as a consequence of network filtering policies, and a need for additional technology-based professional development for teachers and time to practice new skills.

While some positive effects were visible, eight years into the one-to-one laptop initiative problems were evident, and administrative support as well as teacher acceptance seemed to play an important role in teachers' willingness to regularly and enthusiastically modify their pedagogy to include technology in teaching strategies and student lessons.

## CHAPTER 1. INTRODUCTION

Our primary mission. . .has been to enhance how students learn in the classroom and at home. Each of our 63 schools has at least one computer lab as well as a computer for student use in every classroom. In addition, the teachers in our district use computers to track student attendance and grades, and work to incorporate technology into their instruction. . . .We came to realize, however, that in order to raise the bar for teaching and learning and help our students compete in a technology-driven society, we needed to go the extra mile. We decided that the best solution would be to secure a computer for each student. The answer: laptops (Edwards, 2001, p. 1-3).

This quote is from a 2001 *Scholastic Administrator* magazine article written by the former superintendent of a large school district, entitled, “A Laptop for Every Learner: How a Virginia School District is Keeping Learning Alive at School and at Home by Giving Every Student a Laptop Computer” (Edwards, 2001). The superintendent led a team whose mission was to empower teachers and students with technology by facilitating a drastic teaching and learning paradigm shift in this large school district. Eight years have passed since the one-to-one laptop initiative began, and in that time, every student in grades 6-12 has been offered a wireless-equipped laptop to work on while in school and at home. Additionally, the school district provided wireless Internet access at each secondary school and, over time, wireless connectivity was added to every school district building. Because of the initiative, all teachers and students have instant access to powerful digital tools designed to enhance learning (e.g., online resources, virtual simulations and multimedia applications).

## **Statement of the Problem**

In 2001, a large school district embarked on the first-ever district-wide, one-to-one laptop initiative. Phase 1 targeted high schools in 2001. Twelve thousand wireless enabled iBook laptops were distributed to all middle and high school teachers and one for every high school student in the district (Henrico County Public Schools, 2008a). Phase 2 of the initiative reached middle school students. This and other progressive technology initiatives continue to rapidly and dramatically alter the classroom topography with far reaching professional development, financial, social, ethical, and political implications (Willis & Raines, 2001). Although this and other technology initiatives have been studied extensively, none have focused exclusively on the effect technology integration has made on career and technical education's business and marketing teachers. Technology integration includes having a sense of how to weave technology tools into the curriculum so that they become integral in that curriculum (Moursand, 1997). Since the primary goal of career and technology education is to provide students with 21<sup>st</sup> century skills necessary for a successful transition to postsecondary education or work, it is therefore important to evaluate the effect of the one-to-one laptop initiative on the business and marketing teachers' instruction.

## **Rationale for Study of the Problem**

This case study has relevance to school districts with technology initiatives as well as for districts considering one. Every school division in America offers career and technical education (CTE) courses, and although CTE courses are elective subjects and are not part of the core academic curriculum, they are courses that can be an important part of a student's education. In 2008, 19,462 Virginia high school graduates obtained the Career and Technical Education Seal. Of those graduates, 5.48% obtained the Advanced Mathematics and Technology Seal and

44.98% of CTE completers attained an Advanced Studies Diploma (Virginia Department of Education, 2009a). To earn a CTE seal, a student must fulfill the requirements for either a Standard of Advanced Studies diploma, complete a prescribed sequence of courses in a CTE concentration or specialization, and maintain either a B or better average in CTE courses, or pass an exam that confers certification from a recognized industry, trade or professional association (Virginia Department of Education, 2008a). Due to new federal guidelines and iteration of the Perkins Act, career and technical education is undergoing a curricular evolution—one that aligns the CTE curriculum to the core Virginia Department of Education standards.

By conducting a survey, observations and a focus group composed of business and marketing teachers, the research indicated how the one-to-one laptop initiative (hardware, software, digital on-line curriculum and resources) had an effect on business and marketing teachers' level of technology skills. In addition, this research helped address the business and marketing teachers' technology training needs as an essential ingredient to the entire school district's technological initiative.

### **Literature/Research Background**

Over the last eight years, the one-to-one initiative has been the subject of several dissertations and many studies. An example of one study focused on its technology integration effect on Algebra I classrooms and another documented its outcomes between the years 2005 to 2008 (Heinecke, 2008; Mann, 2009). However, the initiative's technology integration has not been studied specifically for its effect on career and technology education. Business and information technology (business) and marketing are two program areas that fall under the auspices of CTE; the primary goals of the curricula are to teach students 21<sup>st</sup> century workplace

readiness skills, to prepare students for postsecondary education, and to prepare them ultimately for success in a business or marketing career.

According to the U.S. Secretary of Labor, Elaine L. Chao (2006), “America is transitioning to a knowledge-based economy, creating millions of new jobs in industries that did not exist a generation ago and which demand highly educated and skilled workers.” Chao also notes that “two-thirds of the estimated 18 million new jobs that were created in the next ten years were occupations that require some kind of higher education—a four-year degree, community college, or a specialized apprenticeship training program.” Once known as vocational education, career and technical education contributes significantly to America’s intellectual capital. Career and technical education plays a major role in educating and preparing students of all ages, backgrounds and experiences ultimately for career success. Dedicated to helping students fulfill their career potential, career and technical education promotes contextual learning, teaching academic material with relevance to the real world. Employability skills, job-related skills, and workplace ethics are the major foci of career and technical education programs. With curricula that is experientially based, career and technical education helps to connect a student’s own life experiences to new information and career experiences. Career and technical education has a comprehensive curriculum that comprises secondary and postsecondary education, corporate training, and continuing education for adults to learn or upgrade and refresh workplace skills. The use of technology is an integral component of the 21st century workplace readiness skill set needed for success. The workforce for the 21st century needs both academically competent and technically-skilled workers to compete in the high performance workplace. To that end, the

current Virginia Standards of Quality state that “. . .career and technical education programs shall be aligned with the industry and professional standard certifications, where they exist” (Code of Virginia § 22.1-253.13:1B).

### **Research Questions**

The principal guiding question for this study was the following: What effect has a comprehensive one-to-one wireless laptop deployment and technology initiative had on business and marketing high school teachers’ technology skills and technology integration over the last eight years? Additional questions to explore included:

1. How has technology (hardware, software) in business and marketing classrooms changed over eight years?
2. How has the initiative enhanced business and marketing teachers’ comfort in using technology?

### **Methodology**

This research was conducted during the 2009-2010 academic school year and was conducted as a case study. The study was divided into three phases to understand how a one-to-one laptop initiative affected 18 business and marketing teachers’ use and technology integration. In the first phase of the study, an online survey was used to obtain descriptive quantitative data. In the second phase of the study, the researcher conducted unannounced classroom observations of teachers’ use of technology. This data provided a snapshot of daily technology use in business and marketing classrooms. The third phase of the study generated qualitative data from focus group interviews of the 18 teacher-participants. The interview questions emerged from data collected from phases one and two of the study. The researcher used the observation data to generate focus group questions. The purpose of this part of the study

was to explore how the teachers used technology while teaching and reasons for any differences in technology use among the teachers.

### **Findings and Conclusions**

The research indicated that the one-to-one laptop initiative changed the way business and marketing teachers in the school division deliver and manage instructional content, and communicate with parents, students, and administrators. Teachers were faced with classroom management and network filtering challenges that impede teaching and learning, and teachers need ongoing technology training and practice to seamlessly integrate technology into classroom instruction to fully utilize technology tools available. According to Bonifaz and Zucker (2004), the need for educators to increase their technology skills and offer quality teaching instruction enhanced by technology instruction in the classroom is universal among all educators.

Most teacher-participants utilized the technology for instruction, not student learning; however, teachers used new technologies in old ways. While using new technologies teachers continue to prepare lessons, lecture students, deliver content and grade assignments in much of the same way they did before the laptop initiative. Teachers must use 21<sup>st</sup> century technologies to teach in student-centered learning environments.

### **Summary**

This research was conducted as a case study of a large school division's technology initiative to chronicle its effect after eight years on high school business and marketing teachers' technology skills and technology integration. The 18 teachers asked to participate in the study were business and marketing teachers from eight high schools, two technical centers, and one alternative school who participated in the one-to-one laptop initiative from its inception. A web-based survey on technology use and adoption was administered to 18 high school business and



marketing teachers. The researcher conducted a total of four unannounced observations of each teacher's instruction, specifically for technology use, using the Instructional Technology Resource Teachers' Technology Integration chart (Appendix A). Additionally, the teachers were asked to participate in one of two focus group interviews to determine their level of technology use along with their perceptions regarding the technology initiative and its effect on their instruction and teaching strategies. This case study has relevance to school districts with technology initiatives or districts considering one. The high school business and marketing teachers' vantage point provided unique information about the effect a one-to-one laptop initiative has made on business and marketing teachers' technology use over the last eight years.

The literature review in Chapter 2 frames this study by way of synthesizing relevant literature and research. Chapter 3 describes the methodologies used for this study. Chapter 4 illustrates the findings. The study culminates with Chapter 5, which details the outcomes and conclusions.

## **CHAPTER 2. LITERATURE REVIEW**

The school district studied is one of the most historic regions in the United States with its history extending as far back as the 1600s. Thanks to the teaching and learning initiative, which brought ubiquitous computing and wireless Internet access, the county has received visibility for providing a technology-rich learning environment nearly unparalleled anywhere in the nation (Intel, 2006). As a result of the initiative, teaching has become more active and individualized and students are better organized and more engaged in learning (Intel, 2006). For successful one-to-one computing, leaders at multiple levels must create a vision, enlist the support of key stakeholders and realign policies. Communication, team building and leadership are essential, both initially and throughout the project. The school district developed a student-centered vision and uses a variety of methods to communicate and build support (Intel, 2006). Student-centered learning is evident when knowledge is constructed by students and the lecturer is a facilitator of learning rather than a presenter of information (Kember, 1997).

Although this large school district's one-to-one laptop initiative has been studied extensively over the last eight years, it has not been studied specifically from the perspective of career and technical education's business and marketing teachers. Career and technical education's focus is largely on preparing students with workplace readiness skills. Twenty-first century skills include hard and soft skills necessary for today's students and workforce to

compete successfully worldwide in a variety of career fields. The hard skills are the basic academic skills needed to complete a task. The soft skills needed include enthusiasm, critical thinking, problem solving, teamwork, professionalism, and communication (Metiri Group, 2001). Research indicates that technology-rich classrooms can provide students with more opportunities to develop higher-order thinking skills greatly needed to compete on a global level (Leh, Kouba, & Davis, 2005). Business and marketing students, who are to compete in the 21st century workplace, should be taught in a technology-rich environment (Leh et al., 2005).

According to Barron and Orwig (1993), technology has become an integral and pervasive part of our personal and professional lives; consequently, it is relevant to chronicle business and marketing teachers' perspectives with respect to the comprehensive technology initiative and its effect on their technology skills and integration. According to the U.S. Department of Labor, Bureau of Labor Statistics (2008), information communication literacy is an important aspect of a person's career life. In 2007, five of the 30 fastest growing careers between 2006 and 2016 included the fields of network systems and data communications, computer software engineering, computer systems analysis, database administration, and computer software systems software. Of the 25 remaining fastest growing careers, use of computers is an integral part of 22 of them (Liming & Wolf, 2008).

This review of the literature is organized to illustrate the importance of examining the effect that a one-to-one laptop initiative has had on business and marketing high school teachers' technology skills and integration. The review follows a progression that begins with a broad overview of vocational education followed by a description of 21st century skills, a brief history of the effect of technology and ubiquitous computing; a snapshot of other one-to-one initiatives, and then concludes with a narrow focus on this study's school division's technology initiative.

## **From Vocational Education to Career and Technical Education**

Today's vocational education system in the United States is the result of an extensive evolutionary process (Gordon, 2008). The apprenticeship agreements of colonial times can be considered the first formalized vocational education system in the United States (Gordon, 2008). The first education law passed in America was the 1647 Old Deluder Satan Act of the Massachusetts Bay Colony (Gordon, 2008). The act set specific requirements for master craftsmen to teach apprentices academic as well as vocational skills (Gordon, 2008). Vocational education became commonly known as industrial education by the mid-1880s as apprenticeships declined and other institutions were needed to assist young students with learning skills (Wells, 1999).

In his 1907 address to Congress, President Theodore Roosevelt advocated major school reform that would offer industrial education in urban areas and agricultural education in rural areas (Gordon, 2008). A strong alliance supporting federal funding for vocational education was formed in 1910 when the American Federation of Labor (AFL) gave its approval to the National Association of Manufacturers' (NAM) introduction of trade instruction in schools (Gordon, 2008). In 1914, President Wilson appointed a commission to study whether federal aid to vocational education was warranted. Charles Prosser, principal author of the commission's report to Congress, considered vocational training with targeted instruction as the best available way to assist nonacademic students in gaining viable skilled employment after completing high school (Gordon, 2008). "In its final report to Congress, the commission chaired by Georgia Senator Hoke Smith declared an urgent social and educational need of vocational training in public schools" (Scott & Sarkees-Wircenski, 1996, p. 6).

Federal support for vocational education began when President Wilson signed the Smith-Hughes Act of 1917, also known as the Vocational Act of 1917, marking the first national approval of vocational education in public schools (Gordon, 2008). Written by Hoke Smith and Dudley Hughes, the act established vocational education in the areas of agriculture, trades and industry, and home economics, and it exemplified the idea that students should be prepared for entry-level jobs by learning specific occupational skills (Scott & Sarkees-Wircenski, 1996). The act called for specific skill training, focused on entry-level skills, and helped establish separate state boards for vocational education (Gordon, 2008). The Smith-Hughes Act and subsequent acts were an effort to retain more students in secondary education, and to provide trained workers for an increasing number of semiskilled occupations during and following the Great Depression to help maintain a prepared workforce (Wells, 1999).

Until 1963 all of the vocational acts, including the 10 Vocational Education for National Defense Acts (1940-1946) and the 1958 National Defense Education Act (NDEA), were designed to train veterans and others as the war industry evolved to peacetime occupations, to increase the number of the separate vocational education programs, and to focus on funding support (Wells, 1999). The vocational education system had been firmly established by the 1960s; however, as America's workforce changed, Congress recognized the need for a new vocational education focus and passed the 1963 Vocational Education Act, the Perkins Act (Gordon, 2008). While still supporting the separate system approach by funding the construction of area vocational schools, the act also broadened the definition of vocational education to include occupational programs in comprehensive high schools, such as business and commerce (Gordon, 2008). The Perkins Act "provided that vocational programs be available for persons in high schools, for those out of high school available for full-time study, for unemployed or

underemployed persons, and for those who have academic or socioeconomic handicaps that prevent them from succeeding in regular vocational education programs” (Wells, 1999, p. 32). However, localities were not responding to the new focus on improving programs and serving students with special needs, so the 1968 amendments to the Vocational Education Act backed each goal with specific funding which proved to be an effective strategy as evidenced by increased enrollment (Wells, 1999). The 1970s brought accountability into the educational mix when the Educational Amendments Act of 1976 called for the National Assessment of Vocational Education (NAVE). Educational accountability would guide legislation for years to come (Wells, 1999). “In 1974, the needs of limited English proficient [LEP] students were addressed through provisions for bilingual vocational training; funds for Native American students were also added. In 1976 LEP students were made eligible for part of the disadvantaged set-aside, and provisions to eliminate sex bias and sex stereotyping in vocational education were added” (Gordon, 2008, p. 73).

By the 1980s, unemployment, school dropouts, large numbers of people on welfare, and increased crime rates plagued the United States (Gordon, 2008). These issues, along with the rapid increase of technology use in business, brought a new sense of urgency to the United States thus prompting a surge of educational reforms. The 1983 National Commission on Excellence in Education report, “A Nation at Risk,” found our nation’s schools in crisis and in dire need of improvement (Association of Career and Technical Education [ACTE], 2008). The report referred to the need for new basic education which included competence in reading and interpreting and using information in the performance of technical tasks. However, the report never specifically addressed the need for workplace preparation so important in our nation’s struggling times (ACT, 2008a). The Carl D. Perkins Vocational Education Act of 1984, known

as the Perkins Act, continued the commitment of Congress to provide effective vocational education programs that were essential to the nation's future (Gordon, 2008). The economic goal was to improve the skills of the labor force and prepare adults for job opportunities, whereas the social goal was to provide equal opportunities for adults in vocational education (ACTE, 2006).

The June 19, 1989 issue of *Fortune* magazine published an article “The New, Improved Vocational School,” in which author Nancy Perry (1989) emphasized vocational education’s role in alleviating skill shortages and dropout rates. Perry wrote “for industry, vocational education could be a godsend” (Perry, 1989, p. 72). “Here’s what vocational education can do: make academics more relevant, keep kids in school, encourage postsecondary education, provide jobs and retrain older workers” (Perry, 1989, p. 72).

In 1990, Congress passed the Carl D. Perkins Vocational and Applied Technology Education Act. In 1994, The School-to-Work Opportunities Act (STWOA) passed to encourage partnerships between employers and educators. The act emphasized preparing students with the knowledge, skills, abilities, and information about occupations and the labor market that would help them make the transition from school to post-school employment through school-based and work-based instructional components (“Times are a Changing,” 2002; Wells, 1999). President Bill Clinton created a National Task Force on Preparing Youth for the 21st Century College and Careers, which emphasized the need for school-to-work initiatives and partnerships between employers and educators (ACTE, 2004); the act was signed into legislation on October 31, 1998. The act increased states’ data collection and reporting accountability (Wells, 1999). The act also emphasized classroom instructional technology use at the postsecondary level by opening a number of technology preparation (Tech Prep) learning sites in community colleges (“Times are a Changing,” 2002). Tech Prep combines a secondary and two-year postsecondary program of

study into a seamless and integrated option for work-based learning (J. Sargeant Reynolds Community College [JSRCC], 2008). Tech Prep programs of study include a blend of academic and career and technical secondary courses that may be articulated and/or dual enrolled with courses (JSRCC, 2008).

Vocational education entered a new era early in 21<sup>st</sup> century in the United States (Gordon, 2008). According to Scott and Sarkees-Wircenski (1996), educators, community members, and politicians acknowledged that the traditional educational focus on college-bound youth needs to change. Greater attention is being focused on work-bound youth, particularly those who require less than baccalaureate education (Scott & Sarkees-Wircenski, 1996). Because research has shown that obtaining workers with a good work ethic and appropriate social behavior is a priority for employers, many school districts have recognized the growing need for vocationalism (Gordon, 2008). Vocationalism is the method used by middle and high schools to organize curricula so students may develop skills, both vocational and academic, that give them the intentional labor market advantages needed to compete for good jobs (Gordon, 2008). Blending vocational and academic assignments is also central to High Schools That Work in which schools engage in raising academic curriculum with contemporary vocational studies (Gordon, 2008). High Schools That Work is a comprehensive, results-based school improvement initiative of the Southern Regional Education Board in cooperation with State Departments of Education (Southern Regional Education Board [SREB], 2008). Vocationalism is also a key component of the New American High Schools initiative (Gordon, 2008). The New American High Schools initiative, started in 1996 under the direction of the U.S. Secretary of Education, Richard W. Riley, is a national recognition program for U.S. secondary schools (Viadero, 2000). By aligning curricula around students' career-related interests, many schools are attempting to



raise student expectations and academic standards (Viadero, 2000). Vocational education also includes work experience programs that provide secondary students the opportunity for hands-on experiences while learning about occupations, required skills, and employer expectations (Scott & Sarkees-Wircenski, 1996). Vocationalism is also a key component of the New American High Schools initiative (Gordon, 2008). School-based enterprises, designed for secondary education students, allow students to apply their classroom knowledge to running real-world businesses (Gehring, 2000). Co-op education is run by individual schools as part of their vocational education programs and students are provided part-time jobs during the school year in their field of vocational specialization (Gehring, 2000). Job shadowing programs allow students to observe a person for a few hours during a typical workday (Swail & Kampits, 2004). Short- and long-term internships allow students to gain a structured hands-on experience in a given occupation for a specified period of time (Swail & Kampits, 2004). Community service programs are school-sponsored, credit-bearing, educational experiences where students participate in organized service activities that meet identified community needs (Swail, & Kampits, 2004). Tech Prep programs provide high-level academic and technical preparatory education, linking high school and post-high school learning experiences. Partnerships among students, faculty, employers, and community agencies are formed and share responsibility for authentic and performance based assessment, achievement of learning expectations and program evaluation (Wolff & Copa, 2002). Youth apprenticeship programs include preparation for postsecondary education as well as employment and are typically designed for high school students who may go on to postsecondary education (ACT, 2008b).

On July 26, 2006, the Senate approved reauthorization of the Carl D. Perkins Career and Technical Education Improvement Act of 2006 (ACT, 2008b). The bill included the following:

“Using the term ‘career and technical education’ instead of ‘vocational education,’ maintaining the Tech Prep program as a separate federal funding stream within the legislation, and maintaining State administrative funding at five percent of a state’s allocation” (ACT, 2008b). Career and technical education continues to rely on the Carl D. Perkins Act for funding and is still considered education primarily for those seeking workplace readiness skills (ACT, 2008b).

Training students for skilled positions (including pre-employment, on-the-job, skill upgrading, and worker retraining) has been the core of career and technical education (Doolittle & Camp, 1999; Scott & Sarkees-Wircenski, 1996). Career and technical education’s responsibility to students, business and industry, and educational community is to identify employability and workplace readiness skills and to teach those skills to students. Career and technical education’s time-tested approach to identifying those skills has been, and remains today, partnering with business and industry to identify and prioritize essential competencies needed on the job (Gordon, 2008).

Today’s career and technical education includes secondary, postsecondary, and adult education levels (Doolittle & Camp, 1999). CTE course offerings in high schools include family and consumer sciences education (FACS), business and information technology education, marketing education, technology education, and trade and industrial education. CTE courses prepare students for the general labor market, military, postsecondary education, or all three (Doolittle & Camp, 1999). At both secondary and postsecondary levels, courses are categorized into career clusters, providing education that prepares students for employment in specific occupations or careers.

According to Meeder (2006):

. . .business, health care, and computer science were among the most common occupational programs in career and technical education.

Specifically, business and computer technology were the most common occupational programs offered by public high school in 2002, and the 2005 public high school graduates earned more credits in business services and in computer technology than in any other occupational program area. At the postsecondary level, more credential-seeking undergraduates majored in business and marketing and in health care than in any other career field in 2004. In addition, a larger proportion of undergraduate credentials were awarded in health care and in business and marketing than in other career fields in 2005. At the adult education level, business, health, and computer science were the topics studied most frequently by work-related course takers in 2004-05 (Meeder, 2006, p. vi).

Most courses provide the student with the opportunity to gain an industry certification that may lead to further education or a significantly better career placement (Meeder, 2006).

Adults may also participate in formal career and technical education and training to acquire, maintain, and upgrade their workforce skills (Meeder, 2006).

A consistent theme found throughout the CTE literature is that career and technical education has increased its academic rigor and standards and is slowly peeling away the long-held stigma of teaching blue collar skills to low-functioning students (Doolittle & Camp, 1999; Freeman, 1996). No longer does vocational education (CTE) conjure up the stereotypical image of grimy masonry or dusty woodworking classrooms; CTE has expanded its offerings with courses such as computer programming, web design, and high-tech engineering classes that feature robotics (ACT, 2008c). This paradigmatic shift leads to increased scrutiny of technology usage in CTE classrooms, CTE teachers' technology skill levels, and the impact of technology on students' workplace readiness and employability skills (Gordon, 2008).

## **Twenty-first Century Skills**

At the same time that the focus of career and technical education shifted to a more academic focus with an emphasis on technology applications, the general education community embraced the 21<sup>st</sup> century skills movement. The thrust of that movement is that in order to bring students the most relevant information and skills, school districts must recognize and welcome 21<sup>st</sup> century changes as part of challenging and rigorous programs and courses (Ashton & Newman, 2006).

In 2001, The Educational Testing Service defined 21<sup>st</sup> century skills as: (a) basic skills such as mathematics and writing; (b) digital-age literacy such as technological, cultural, and global awareness; (c) inventive thinking such as creativity, problem solving, and sound reasoning; (d) communication and interpersonal skills such as collaboration and teamwork; and (e) productivity, such as high quality products (Educational Testing Service, 2001, p. 6). That same year, the Metiri Group (2001) compiled a list of 21<sup>st</sup> century skills useful for educators, businesses, and governmental and nongovernmental agencies. The Metiri Group's enGauge 21<sup>st</sup> Century Skills list was developed through lengthy and comprehensive research on nationally recognized technology skill sets, emerging technologies, "the characteristics of the Net-Generation, reviews of current reports on business and industry workforce trends, and input from educator surveys and focus groups" (Metiri Group, 2001, p. 4).

According to the Metiri Group (2001), which partnered with the North Central Regional Educational Laboratory, teachers and students need to have digital-age proficiencies. Therefore, in the interest of providing students the necessary tools to succeed, school districts must define, understand and accept 21<sup>st</sup> century skills as part of their demanding academic standards. The four

basic 21<sup>st</sup> century skills include digital age literacy, inventive thinking, interactive communication, and quality, state-of-the-art results (Metiri Group, 2001, p. 5).

Today, the organization most prominently advancing the 21st century skills movement is The Partnership for 21st Century Skills (P21). The organization brings together political, educational, and business community leaders to determine a robust plan for today's students to leave school with the necessary skills needed to be productive and successful citizens and leaders in the 21st century. The Partnership maintains that every student must be ready for an ever-changing world (Partnership for 21<sup>st</sup> Century Skills [P21], 2009, p. 2). The group established six important elements of 21st century learning: (a) an emphasis on core subjects (with deeper focus); (b) an emphasis on learning 21st century skills (e.g., thinking critically, collaborating, applying knowledge to new situation); (c) the use of 21st century tools (ICT-information and communication technologies) to develop learning skills; (d) employing strategies for teaching and learning 21st century context (authentic relevant experiences); (e) employing strategies for teaching and learning 21st century content (global awareness, economic and civic literacy); and (f) use of 21st century assessments (valid and/or technology based) that measure 21st century skills (P21, 2009).

While much of the P21 (2009) initiative is about learning, at the core of the movement are the new learning affordances made possible by technology. Information and communications technology (ICT) literacy is the new component to the skill set needed to succeed in the 21st century. It is the ability to use technology to develop relevant content knowledge and skills in support of 21st century teaching and learning. There is no universally accepted definition of ICT because the applications and methods used are constantly evolving; however, ICT involves the storage, manipulation, retrieval, transmission and receipt of data or electronic information in

digital form (“Tutor2u,” 2010). The term includes the use of computers and the Internet as electronic information-processing technologies. The information needed includes basic computer-based technologies such as word processing, databases, spreadsheets, presentations, graphics, and desktop publishing software. The communication needed is ability to digitally transmit and share electronic information over considerable distance via internal or external networks sending and receiving equipment. The equipment consists of wires and satellite links, broadband, and various specialized application devices ranging from barcode scanners and Braille readers to global positioning systems or GPS (“Tutor2u,” 2010).

### **A Brief History of Technology in Education**

The history of computing in education has two major periods: the time before the advent of the World Wide Web, and the current period beginning in 1995. With the web came three converging trends: the advent of relatively affordable technology in transportable packages; the rapid improvement in communication capability through wireless networks; and the invention of browsers that allowed everyone to explore, navigate, and search digital worldwide knowledge sources (Zucker, 2004). This combination established a powerful acceleration of searchable information that resulted in a paradigm shift in the way teachers and students view learning with technology (Dede, 2004). The web was originally designed as an information source.

Prior to the web, software applications for computer-based education were available to students and connectivity was not important (Byrom & Bingham, 2004). The web made it possible for students to gather vast amounts of information, and communicate with others in real-time, forever changing the possibilities for teaching and learning. These capabilities have had a powerful effect on the growth of ubiquitous computing in K-12 education (Zucker, 2004).

Today the web is much more than simply an information source; it is an interactive tool. Students can collaborate, share information, and interact with each other as contributors to a website's content. Examples of new technology (Web 2.0) include web-based communities, social networking sites, video sharing sites, web applications, wikis, and blogs (McAfee, 2006). Web 2.0 websites typically include some of the following features and techniques: search, links, authoring, tags, extensions, and signals (McAfee, 2006). The student can use the search feature to find information via a keyword search. Links are connections to meaningful information while providing low-barrier social tools. The student can create and update content (author) while tags are usually one-word descriptions that facilitate searching. Extensions are software that makes the web an application platform as well as a document server. And finally, syndicated technology such as Really Simple Syndication (RSS) use signals to notify users of changes (McAfee, 2006). Students can actively participate and contribute to a rich learning experience for a community of web users by using Web 2.0 technologies.

The web continues to evolve to meet the needs of a diverse and changing world of students. The web is on the cusp of a new generation (Web 3.0), and is referred to as the read/write/execute web. Web 3.0 is moving toward meta-data that is granular information to help discoverability on the web (Brazell, 2009). Web 3.0 utilizes application programming interfaces (APIs) that allow developers to take content from video-sharing sites like YouTube or Twitter, and repurpose it "into something usable in other forms by humans, applications and mobile devices" (Brazell, 2009). Web enabled mobile devices have made their way into classrooms across the county and have enriched the learning experiences of students. According to Joan Ganz Cooney Foundation Center at the Sesame Workshop, "advances in mobile technologies are showing enormous untapped educational potential for today's generation" (Schachter, 2009).

Web 3.0 can be defined as the creation of high-quality content and services produced by gifted individuals using Web 2.0 technology as an enabling platform. According to Conrad Wolfram, Web 3.0 is where "the computer is generating new information." rather than humans (Wolfram, 2010). "Manoj Sharma, an organization strategist, in the keynote 'A Brave New World Of Web 3.0' proposes that Web 3.0 will be a 'Totally Integrated World'—cradle-to-grave experience of being always plugged onto the net" (Keen, 2008). Students who use Web 3.0 technologies have a new world of learning possibilities not yet fully explored.

Simply put, Web 1.0 is like a library where the student accesses information, Web 2.0 is like a community of family members and acquaintances where the student shares information and, Web 3.0 is like a student's own database personal assistant who knows almost everything about the student and can access all the information in the Internet to answer a question. The next web generations will continue to be a dynamic and participatory resource for students to enhance their learning opportunities.

### **The Effect of Technology on Education**

According to the U.S. Department of Education (Noeth & Volkov, 2004), technology is making a significant impact on education. The degree of educational technology effectiveness is influenced by the level of student access to the technology, the student population, the software available, the teachers' commitment to technology, and the appropriate grouping of students (Noeth & Volkov, 2004). Research also indicates that providing wireless access, laptops and a technology-rich environment to students has the potential to change classrooms and improve learning and outcomes (Roschelle, Penuel, & Abrahamson, 2004).

Evidence suggests students who are part of a technology-rich environment, and who are exposed to a collaborative learning environment with interactive video that incorporates a



research-based instructional design, have increased student achievement (Hartley, 2007). Introducing technology into the classroom has been shown to increase interaction between teacher and student and encourage cooperative learning, ultimately making learning more student-centered and shifting responsibility for controlling learning to students (Swan, Kratcoski, Mazzer, & Schenker, 2005, p. 262). According to Hartley (2007), students can benefit when technology is used for complex problem-solving and information-retrieving purposes.

Online and computer-based courses have helped to increase student-to-student and student-to-teacher interaction for all students including those considered academically challenged (Keengwe, 2008). “Use of online telecommunications for collaboration across classrooms in different geographic locations has also been shown to improve academic skills” (Bialo & Sivin-Kachala, 1996). Many students in an online environment who seldom participate in face-to-face class discussion in traditional learning environments have become more comfortable and active participants (Keengwe, 2008). Greater student cooperation, sharing, and helping behaviors occurred when students used online and computer-based learning that had students compete against the computer rather than against each other (Hartley, 2007).

Researchers found achievement gaps narrowing between students of color and white students and between disadvantaged and more advantaged students when all students were given the opportunity to use laptop computers (Stevenson, 2008). Zucker and Hug (2007) assert data that show technology initiatives bridge the digital divide by providing underrepresented students equal access to computers, computer skills, and sources of information that they did not have before.

## **Ubiquitous Technology: A New Policy Frontier**

Although earlier technology initiatives provided students with desktop computers for home use or laptops with limited or no Internet capabilities (Haynes, 2004), most of today's initiatives provide a wireless-enabled laptop computer with Internet access to each student in a school or school division. There have been statewide and countywide initiatives along with hundreds of independent, private, public, and parochial schools with technology initiatives that provide 24/7 access to computers and Internet connections (Penuel, 2006).

According to Bonifaz and Zucker (2004) in the Education Development Center report entitled, *Lessons Learned About Providing Laptops for all Students*: "One-to-one computing environments are different from what one traditionally finds in most school settings because they offer all students and teachers continuous access to a wide range of software, electronic documents, the Internet, and other digital resources for teaching and learning" (p. 6).

The basic tenet of one-to-one computing is for all students and teachers to have access to Internet-connected, wireless computers at school, thus alleviating the need to move classes to computer labs. Ubiquitous computing is about access to information, engaging students and encouraging them to take responsibility of their own learning (Bonifaz & Zucker, 2004). The following definition of educational ubiquitous computing, as presented by Swan et al. (2005) for the Research Center for Education Technology, describes the potential that ubiquitous computing has had on education:

We define ubiquitous computing environments as learning environments in which all students have access to a variety of digital devices and services, including computers connected to the internet and mobile computing devices, whenever and wherever they need them. Our notion of ubiquitous computing, then, is more focused on many-to-many than one-to-one or one-to-many, and included the idea of technology being always available but not itself the focus of learning. Moreover, our definition of ubiquitous computing included the idea that both teachers and students are active participants in the learning process, who critically

analyze information, create new knowledge in a variety of ways [both collaboratively and individually], communicate what they have learned, and choose which tools are appropriate for a particular task. (Swan et al., 2005, p. 7)

There is a growing body of research that demonstrates the impact of how a high ratio of computers to students and one-to-one computing may change teaching and learning dynamics in classrooms (Garthwait & Weller, 2005). The nature of this impact is still evolving but research indicates that learning activities, teacher and student relationships, and parent involvement are different in schools where one-to-one computing has been implemented (Knezek & Christensen, 2005; Zucker & McGhee, 2005). According to *The Progress of Education Reform 2006 Technology in Education* report, these initiatives have enhanced student achievement and educational opportunity by (a) “transforming classrooms into more engaging, collaborative and productive learning environments in which instruction can be customized to students’ specific needs, interests and learning styles; (b) improving students’ preparation for living, working and learning in a rapidly changing, information-driven world; and (c) reducing the ‘digital divide’ between students who have access to technology at home and those who don’t” (Education Commission of the States, 2006).

Advantages of laptop computing span from improvements in attendance and discipline to increases in student achievement (Bielefeldt, 2006). Knezek and Christensen (2005) report that discipline referrals in Texas schools participating in laptop initiatives dropped, while referral rates in comparison schools without laptops increased. Students access a broader array of learning resources and report an increase in collaboration with others and an increase in technology use for learning (Zucker & McGhee, 2005). With an increased use of educational technology, writing assessment scores increased in the Microsoft/Toshiba Learning Anytime Anywhere Pilot (Zucker & McGhee, 2005). Positive changes in students’ attitudes toward school

were cited in Palm's Education Pioneers program survey responses (Zucker & McGhee, 2005). Changes in relationships between teacher and students were reported as students and teachers increased the frequency and quality of supportive individual and group interactions (Rockman, 2004). Research indicates that in schools participating in laptop initiatives, parents' attitudes toward schools and their involvement and communication increases (Rockman, 2004). Finally, school officials report as a result of Maine's laptop initiative, student achievement increased with significantly higher test scores than comparison schools in science, math and visual/performing arts (Muir-Herzig, 2004).

### **Technology Initiatives**

At least 33 states have implemented one-to-one computing programs with more states expected to follow (Lei & Zhao, 2008). Of the states with technology initiatives, those in Maine, Michigan and Texas are representative. These initiatives were examined with regard to the impact that one-to-one computing has made on teaching and learning.

Maine pioneered the first student laptop program in 2002 by giving all seventh and eighth grade students and their teachers portable, Internet enabled laptops as a basic learning tool. The Maine Learning Technology Initiative (MLTI) provided laptop computers, technical assistance, and professional development for integrating technology in the classroom (Association for Better Living & Education International [ABLE], 2008, p. 4). The October 2007 report found that with exception of writing, there was no appreciable change in Maine Education (MEA) scores since the inception of the laptop program (ABLE, 2008, p. 4).

With regard to laptop use by teachers and students, the 2007 report indicated 79% of students use laptops to research information, with 44% using them to write/edit papers, 42% to take notes, and 41% to organize information. Seventy-four percent of teachers use laptops to

communicate with colleagues, and 64% use to develop instructional materials or provide classroom instruction (ABLE, 2008, p. 5).

Michigan's 2002 Freedom to Learn (FTL) program was initiated by the state to help "students develop into self-sustaining, self-directed learners"(ABLE, 2008, p. 5). The program's goals included preparing students for 21<sup>st</sup> century workforce, provide greater access to equal educational opportunities through ubiquitous access to technology, and promote effective use of technology through systematic staff development (ABLE, 2008). FTL initially targeted sixth grade students, but expanded to seventh and eighth students and included some high school students. During the demonstration phase, a total of 7,256 students participated in 15 schools. Expansion of the program began in the fall of 2004 with a focus on middle school students. "As of June 2008, FTL has served 30,000 students and 1,500 teachers in 200 schools across 100 school districts" (ABLE, 2008, p. 6).

Based on a 2004-2005 Freedom to Learn program survey of Michigan students and faculty, 61% of students reported that they were more interested in learning and computer use made school work easier. Eighty-eight percent of teachers reported that student-centered practices increased, as did student motivation (90%), and technological skills (95%). Eighty-five percent of teachers believed that instruction and learning improved when students engaged in one-to-one computing (ABLE, 2008, p. 7).

The March 2007 evaluation by the Center for Research in Education Policy (CREP) for the 2005-2006 school term confirms the FTL survey findings; however, it "does not present any evidence linking computer usage with student achievement on tests" (ABLE, 2008, p. 7).

Finally, established in 2003, the Texas Technology Immersion Project was charged with the "primarily goal of increasing the academic progress of students by immersing campuses in

technologies that are directly linked to the enterprise of teaching and learning” (O’Hanlon, 2007).

The Texas Center for Educational Research (TCER) has used annual surveys of students, teachers, administration and Texas education data sources to evaluate the affect of the laptop initiative. TCER’s 2006-2007 evaluation reports the following effects on students and teachers: “Technology immersion significantly increased students’ technology proficiency, . . .reduced the proficiency gap between economically advantaged and disadvantaged students, and significantly increased the frequency of interactions with peers in small-group activities. Immersion students had significantly fewer disciplinary actions (0.65 compared to 0.90 in Cohort 1 [eighth graders], 0.53 compared to 0.86 in Cohort 2 [seventh graders], and 0.47 compared to 0.75 in Cohort 3 [sixth graders]) than control group students. Immersion students also had significantly lower school absence rates (96.3% compared to 97.2%)” (ABLE, 2008, p. iii).

The TCER reported the following effects of the laptop initiative on academic achievement on the Texas Assessment of Knowledge and Skills (TAKS) test:

Immersion had no statistically significant effect on students’ TAKS reading score and the effects on social studies, science, and writing scores are inconclusive. Immersion had a statistically significant effect on TAKS mathematics scores, especially for students who were economically advantaged or higher achieving. Students who had more access to laptops and used laptops for learning to a great degree, especially outside of schools (based on the number of days they had access to laptops throughout the school year, frequently of technology use for learning in core-subject classes, and laptop use for homework and learning games) had significantly higher TAKS reading and math scores. The positive effects on TAKS scores became stronger over time. The third year is the first one to show significant positive effects of immersion on achievement (ABLE, 2008, p. iv).

Based on the three one-to-one computing initiatives presented there was little evidence linking computer use with student achievement on assessments. However, students used laptops

to research information, write and edit papers, take notes, and organize information and teachers used laptops to communicate and to develop instructional materials.

## **The iBook Teaching and Learning Initiative**

A large school division's geographic and demographic diversity played a major role in its administrative team's decision to partner with Apple Computer Corporation and embark on the nation's first district-wide one-to-one laptop initiative. The 2001 launch of the iBook Teaching and Learning Initiative was unique and unparalleled in the way a school division integrated technology into its classrooms. At the time, the initiative was the largest and most ambitious of its kind (Zucker & McGhee, 2005).

The need for comprehensive school reform was also part of the justification for the initial decision to begin a division-wide technology initiative that would bring the school division's classrooms from traditional to technology-rich. The objectives of the initiative were to:

(a) prepare students for the world in which they live, (b) provide meaningful instruction, (c) close the digital divide, and (d) improve academic performance (Henrico County Schools, 2008b).

As reported on the Apple Inc. website, the school district's superintendent was quoted in 2001 as saying: "With our iBook laptop program, instead of having one hour a week in a computer lab, our students now have the opportunity for continuous learning, 24/7. They're using their iBook computers on the school steps, on the playground, at home. . . everywhere they go. The wireless world, along with the portability of the laptops, and the dynamic nature of the digital content are creating a synergy that have a huge impact on schools and classrooms (Henrico County Schools, 2008b).

Phase 1 of the iBook Teaching and Learning Initiative was unveiled during the 2001-2002 school year when 11,000 high school students, teachers and administrators received laptops. Phase 2 took off when middle schools were included, bringing the total number of



laptops issued to 24,000 students in grades 6 to 12 and 3,300 laptops distributed all teaching and administrative staff (Zucker & McGhee, 2005). One goal of the initiative was to provide wireless laptop computers with around-the-clock Internet access at schools and the opportunity to obtain home Internet access at a reduced rate to all students, thus closing the digital divide. The initiative was also to provide teachers and students with a technology-rich environment complete with robust and dynamic tools and digital lessons by which to teach and learn (Henrico County Schools, 2008b).

With comprehensive school reform as another of its cornerstones, the initiative provided access to content-rich curriculum developed by teachers and specialists and opened the door to the Internet's dynamic, real-time information, providing students and teachers with a tool with which to experiment, extend learning, and instantly communicate (Zucker & McGhee, 2005). Through the initiative, the school division strived to provide a quality education with state-of-the-art technology so that all students were well prepared for college and the workplace in the 21<sup>st</sup> century (Zucker & McGhee, 2005).

Currently, the emphasis in the school division is on helping teachers integrate the ubiquitous technology effectively into their teaching (*K12 Computing Blueprint eNewsletter*, 2006). In addition, the division is complementing the laptop initiative with investments in “interactive whiteboards and other intelligent classroom solutions, as well as a virtual-test location that keeps students from accessing other electronic resources while taking a digital exam” (*K12 Computing Blueprint eNewsletter*, 2006, p. 23).

The school division's one-to-one laptop initiative (the initiative) has been studied over the last eight years by researchers from other school districts, states, and organizations. Although

implementation of the initiative varied from school to school, there were commonalities. Assistant principals were assigned to distribute and manage laptop usage and to oversee the technology infrastructure and technology support to all users. Laptops were distributed to middle school teachers in January 2002 and students received their laptops in January 2003. The Interactive, Inc. evaluation of the initiative found the following: “Based on surveys of laptop use and ‘pinging data’ [randomly taking selections of laptops to see who is using them], students who used laptops the most frequently had significantly higher scores on Virginia’s Standards of Learning (SOL) tests in World History, Biology, Reading, and Chemistry. Students who used laptops the most frequently had significantly lower scores in Algebra I & II and Writing. Over time, use of laptops in school division has increased; at any given moment, 40% of students are using their laptops” (Mann, 2007, p. 19).

An earlier evaluation of the school division’s program was collaboration between SRI International and the Educational Development Center, Inc. Researchers collected data through the end of the 2003-2004 school terms from focus groups by using data from the 2002-2003 and 2003-2004 school terms. The overall consensus of teachers, students, and parents interviewed saw the initiative at school and home as beneficial. The results of the study indicate many positive effects on students, teachers and families. There is greater access to instructional resources and information, increased student motivation, engagement, interest, and self-directed learning, and more student interaction with teachers. Students are better organized and teachers have more instructional flexibility and collaboration time. Additionally, there is improved home-school communication. Challenges included the increased need for planning time and added challenges for teachers to manage classroom discipline (Zucker & McGhee, 2005, p. ii).

Additionally, Zucker and McGhee (2005) found factors that present barriers to the use of laptops. Among the barriers noted were the need for support for and commitment to the initiative, the need for school-based technology trainers, the need for professional development for teachers and the need for hardware, software, and technical support (p. iii, iv)

Teachers, students, and administrators also identified several barriers to the use of laptops. Among the barriers identified by teachers, students, and administrators were the need for laptop durability, the need for a robust laptop battery life, the need for students to bring their laptops to school, the need for teachers to monitor laptop use, and the need for time for teachers to prepare electronic- and paper-based assignments (Zucker & McGhee, 2005, p. iv).

Although the school division's technology has been studied for core subject teachers and at the county level it has not been studied specifically for career and technical education's business and marketing teachers. Since technology has become a pervasive and important element of our daily personal and professional lives, it is relevant to chronicle business and marketing teachers' perspectives with respect to the comprehensive technology initiative and its effect on their technology skills and classroom integration.

## **CHAPTER 3. DESIGN AND METHODOLOGY**

### **Research Design**

The overall purpose of this study was to evaluate the effect of a large central Virginia school district's one-to-one laptop initiative on the career and technical education business and marketing teachers' instruction. The principal guiding question for this study was: What effect has a comprehensive, one-to-one laptop initiative had on business and marketing high school teachers' technology skills and technology integration? Additional questions to explore included:

1. How has the initiative enhanced business and marketing teachers' comfort in using technology?
2. What technology is used routinely by business and marketing teachers today that was not used a in a classroom eight years ago?

To answer these questions, a case study research design was employed. Case studies are in-depth investigations of a single person, group, event or community. The case study approach emphasizes exploration rather than prescription or prediction. Case studies provide the complete story by collecting data from a variety of sources and by using multiple methods (i.e., surveys, artifact review, observations, and focus group interviews). The researcher is able to begin with broad questions and narrows the focus as the study progresses. The key strength of a case study is that it provides much more detailed information than what is available through statistical analysis (Hamel 1992; Yin, 2009). By learning as much as possible about a small group of

participants, case studies emphasize the mining for and collection of rich data. The emphasis on rich data can help close the gap between abstract research and concrete practice by allowing the researcher to compare firsthand observations with the quantitative results obtained through other methods of research (Hamel 1992; Yin, 2009).

Evidence was systematically and appropriately collected by well-designed data collection methods. This study had two distinct strands, one quantitative and one qualitative, “each with its own questions, data, analysis, and inferences” (Creswell & Tashakkori, 2007, p. 108). The databases for each component of this study were analyzed using well-developed analytic procedures. Meaningful inferences were made from the results of each strand, and validation procedures reported using triangulation and member checks (Creswell & Tashakkori, 2007). The researcher collected quantitative data in the first phase and based on the results of the survey administered, qualitative data was collected in the second and third phases “to elucidate, elaborate on, or explain the quantitative findings” (McMillian, 2004, p. 289). The researcher developed a well-constructed study to ensure construct validity and reliability (Yin, 2009). The researcher used multiple pieces of evidence from multiple sources to reveal convergent lines of inquiry to ensure internal validity (Merriam, 1998; Yin, 2009). The researcher attempted to establish a consistent chain of evidence. External validity suggested whether or not findings were generalizable beyond the immediate case (Merriam, 1998; Stake, 1995; Yin, 2003).

In Phase 1 of the case study, data were collected via an online survey. The second phase of the study was classroom observations. The third phase was focus group interviews of 18 teachers. The qualitative focus group questions were based on information derived from the results of the first and second phases of the study. The researcher integrated or connected the two strands to provide a more complete understanding of the phenomenon studied, emphasizing both

the quantitative and qualitative process (Creswell & Tashakkori, 2007). In order not to lose sight of the study's purpose, the researcher employed a systematic method of organizing the large amounts of data generated from each phase. A comprehensive database was developed to categorize, sort, store, and retrieve data for analysis (Yin, 2009). The researcher developed one database for the collected survey, observation, and artifact data. The data included scanned hard copies of teachers' documents and electronic copies of teachers' documents used while being observed. The FileMaker Pro database also included the survey data, electronic and scanned artifacts, field notes, 72 scanned observation forms, and the disaggregated observation form data.

### **Setting of the Study**

The school district spans a total of 245 square miles including 238 square miles of land and 7 square miles of water. The three geographic areas are further divided into five magisterial districts, each distinctive with regard to its demographics, business and industry, and population density. According to the 2000 census, the number of people living in the West End, North Side and the East End geographic regions was 262,300 (U.S. Census Bureau, 2000). At the start of the 2001-2002 school term, the school district served 42,250 students with a total of 61 schools (42 elementary schools, nine middle schools, seven high schools, two technical centers and one alternative school). September 2001 data reveal that the school district's school population was comprised of approximately 3.95% Asian, 2.24% Hispanic, 34.61% Black, 58.97% White and .21% classified as American Indian/Alaska Native (U.S. Census Bureau, 2000). Today, the school division's student population for this region is over 48,000 with 69 schools comprised of 45 elementary schools, 13 middle schools, nine high schools and nine technical centers. November 2009 statistics indicate that school division's student population is comprised of 6.5 % Asian, 36.6 % Black, 4.8 % Hispanic, 45.5 % White and 6.6 % classified as Other,<sup>7</sup> making

the school division a minority-majority (U.S. Census Bureau, 2000). Minority-majority is a term used to describe a jurisdiction with racial composition less than 50% White. “‘White’ in this context means Non-Hispanic Whites (Wikipedia, 2010a).

The school division’s Career and Technical Education Department provides students with the opportunity in elementary, middle, and high school to develop academic, computer, technical, leadership, and workplace readiness skills. The county provides students interested in two-year concentrated CTE programs at two technical centers. The programs at the technical centers focus primarily on workplace readiness skills that included many of the trades: cosmetology, veterinarian technology, automotive technology, electricity, and masonry. Additionally, the county provides students interested in concentrating their efforts on engineering or information technology at two career and technical education based high school specialty centers, the Center for Engineering and the Center for Information Technology.

The elementary school CTE component has been integrated into the school division’s K-5 curriculum through design, technology, and engineering curriculum, known as Children’s Engineering. The goal of this program is to provide relevant classroom instruction to help young students develop technological capabilities. Career and technical education defines technological capability as the ability to use, manage, assess, and understand technology (Virginia Technology Education Association, 2009).

Middle school programs include technology education, business education, and family and consumer Sciences. Students are given hands-on opportunities in woodworking, keyboarding, entrepreneurship, culinary arts, and education for employment. At the high school level, students are exposed to opportunities in agricultural education, business education, family and consumer sciences, health and medical sciences, marketing, technology education and trade

and industry. Each career and technical education program supports the Virginia Standards of Learning through the integration of core academic components. Career and technical education teachers prepare students for postsecondary education while teaching them marketable skills.

### **Participants**

Study participants were all business and marketing high school teachers who have been a part of the laptop initiative since its inception. The participants were recruited from two technical centers, eight comprehensive high schools, and one alternative high school. Business and marketing are just two specialty areas included in career and technical education. Business and marketing teachers were chosen for this study because, according to the Metiri Group, the content and skills taught in both subjects are highly sought after in private industry and are considered to be in the vanguard of 21<sup>st</sup> century skills necessary to be successful in current and future careers (K12 Blueprint Computing eNewsletter, 2006).

High school business and marketing teachers who taught eight years or more were identified by the school division and were sent a participant letter (Appendix B). The letter was an invitation to take part in a research study by answering an online survey, agreeing to being observed, and participating in a 60 to 90-minute focus group discussion. The purposeful sample of 18 participants included 16 women, comprising 88.9% of the participants, and two men comprising 11.1% of the participants (see Appendix C for participants' complete professional profiles). Of the 18 participants, nine teach business (eight women and 1 man), and nine teach marketing (eight women and one man). All participants have taught for eight or more years (the duration of the laptop initiative) and all teach at the high school level. All participants' technology education and training described in this study is exclusive to the laptop initiative's eight-year time frame. Every participant is required by the school district to post student grades



to *Link*, a password protected online program accessible to teachers, students and parents. All participants and their students have access to and use the Virtual Drop Box and Share Folders available on the school district's server. They have all received school-based technology training for programs needed to maintain their daily routine: WinSchool, MacSchool, *Link*, Exam View, and eClass Grades. During that same time frame some teachers have received additional technology training and have taken college level courses to further enhance their instruction and the students' learning experience with technology. Additionally, because of the nature of the business courses taught, some teachers have had to take technology-based classes in order to teach the ever-changing technology-based business curriculum. The additional training and education is noted for each participant in Appendix C. Table 1 is a summary of the participants' ages.

Table 1

*Participants' Age Range Demographics and Percentages*

Age Ranges	N	%
33-39	2	11.1
40-45	1	5.6
46-49	3	16.7
50-55	5	27.8
56+	7	38.9
Total	18	100.0

No participants were under the age of 32. Two participants, or 11.1% of the study, were between the ages of 33-39. One participant, or 5.6% of the study, was between the ages of 40-45. Three participants were between the ages of 46-49, for 16.7%. Five participants or 27.8% of the study were between the ages of 50-55, while seven participants were over the age of 56, for 38.9% of the study. When combining age ranges, 12 of the 18 participants, or 66.7%, were above the age of 50 and the remaining 33.4% of the participants were between the ages of 33-49 years of age.

The study was comprised of only business and marketing teachers. Some of participants teach both business and marketing. Table 2 is a summary of how the participants categorize what they teach.

Five of the 18 participants, or 27.8%, teach marketing exclusively. Twelve of the participants, or a total of 66.7%, exclusively teach some type of business class. However, of those 12 participants, 27.8% or five participants, teach lecture-based business classes such as accounting, business law, and business management. One person, or 5.5% of the participants, teaches an equal number of business and marketing classes.

## **Data Collection**

### **Phase 1: Electronic Survey**

Phase 1 consisted of an electronic survey intended to document perceived levels of technology skills and integration (see Appendix D). The instrument was developed using SurveyConsole™, an online program that allows the researcher to use a variety of tools by which to disseminate, collect, record, and disaggregate data. According to Klassen and Jacobs (2001), electronic surveys tend to result in higher response rates and higher quality of responses. Reduced cost, easy retrieval, and ease of entering responses into a database are additional



Table 2

*Participants' Best Description of Subjects Taught*

Survey Statement That Best Describes the Participant	N	%
-Most or all of the classes I teach are marketing (which may include advanced marketing, SERM, or fashion marketing).	5	27.8
-Most or all of the classes I teach are keyboarding applications, keyboarding/WP, or Intro to Computer Apps.	3	16.7
-Most or all of the classes I teach are computer based (EX: CIS, ACIS, DMWT, Programming).	4	22.2
-Most or all of the business classes I teach are lecture based (EX: accounting, business law, business management).	5	27.8
-I teach an equal number of business and marketing classes.	1	5.5
Number	18	100.0

attributes of Internet-based or electronic surveys (McMillian, 2004). McMillian also asserts that “electronic surveys are most effective with targeted professional groups, with ‘in-house’ groups, when they are short and simple, and when a password can be used to assure anonymity” (p. 199).

The 18 selected business and marketing teachers completed the survey anonymously within a prearranged and predetermined window of time and submitted the surveys electronically. The survey consisted of 12 questions. The first five questions consisted of demographic information such as gender, age, years taught, and type of classes taught. The survey then included seven questions based on the standards included as a part of a large central Virginia school district’s, Technology Integration Progression Chart (TIPC). The TIPC was developed by a large central Virginia school district’s staff development department using the National Educational Technology Standards (NETS) for Teachers and the information from the Partnership for 21<sup>st</sup> Century Skills (International Society for Technology in Education [ISTE], 2000). The summer 2006 Technology Integration Progression Chart technology standards by which teachers were assessed include the following: (a) organization of teaching and learning space, (b) digital organization, (c) use of electronic resources for instruction, (d) use of electronic resources for assessments, and (e) support of student-centered learning (see Appendix E).

Table 3 displays an example of the online survey that addresses the participants’ level technology integration. The five TIPC standards are delineated on the left side of Table 3 and the corresponding survey statements are displayed on the right side. Participants were asked to select a level from 1 to 7 that best describes their particular classroom situation.

Table 3

*TIPC<sup>a</sup> Standard and Corresponding Online Survey Statements*

TIPC Standard	Survey Statement(s)
Organization of teaching and learning space.	<p>1. I do not consider the organization or arrangement of my classroom for the use of student laptops.</p> <p>2.</p> <p>3. I am aware of the importance of classroom organization and arrangement to manage student use of technology.</p> <p>4.</p> <p>5. I stage my room arrangement to best fit instruction.</p> <p>6.</p> <p>7. I dynamically configure my room for instruction so that transitions are seamless.</p>

<sup>a</sup>TIPC = Technology Integration Progression Chart

## **Phase 2: Observations and Artifacts**

For the second phase of the study, data were collected using “nonparticipant observations” (Forcese & Richer, 1973, p. 143). Unannounced classroom observations of the participants were conducted twice a month for four months to determine typical technology use. The researcher was not an impartial observer but rather the participants’ central office curriculum specialist responsible for the periodic observation and evaluation of business and marketing teachers. The observation tool used was based on the Instructional Technology Observation form developed by the school division’s Instructional Technology Resource Teachers (ITRT) to document teachers’ technology integration as it relates to the Technology Integration Progression Chart (TIPC). The observation form is included in Appendix F. Unannounced observations allowed data collection without interference in participants’ behavior (Forcese & Richer, 1973).

This phase also included the collection of relevant artifacts from business and marketing teacher-participants. The artifacts were collected and added to a comprehensive FileMaker Pro database to provide a detailed understanding of the teachers’ lived classroom technology experiences (Creswell, 2009). Relevant electronic documents included lesson plans, grade books, and teachers’ web pages, spreadsheets, an Elluminate® session link, a student-created voice thread, and a teacher’s wiki page (Creswell, 2009). In order to add some electronic data to the database, the researcher had to take print screen shots of teachers’ spreadsheets, Elluminate® session page, student created voice thread, and a teacher’s wiki page. Participants emailed the researcher PowerPoint slide presentations and a students’ video presentation rubric that were added to the database. Hard copies of relevant artifacts were scanned into a password-protected computer, saved in PDF file format, and also added to the comprehensive database. Artifacts

collected from the classroom observations were analyzed to help document the participants' technology use while teaching. The type of technology used for student learning included hardware, software, and online resources. Software examples include the use of the Microsoft Office Suite and Adobe products. Hardware examples include the use of responders, interactive whiteboards, and LCD projectors. Online examples include the use of discussion boards, blogs, wikis, virtual field trips, and web pages.

The purpose of collecting artifacts used during participants' observations was to add greater meaning to the observational data collected. The researcher examined the artifacts to gain a better understanding of what technology was used by the teacher and students, how it was used for instruction. Table 4 is an example of the artifact collection log.

Table 4

*Teacher's Artifact Collection Log*

Participant-teacher_____		
Type of Artifact	Artifact Date	Type of Technology Use Denoted
Weekly lesson plan		
Student handout(s)		
TCIP documentation		
Teacher's web page		

### **Phase 3: Focus Groups**

The third phase of the study made use of two separate focus groups, each 60 to 90 minutes in duration to clarify and expand upon data from the electronic surveys, observations, and artifacts. Due to the sprawling geographic area of the county, one focus group was conducted at a high school situated in the eastern area of the county and the second was conducted at a high school located in the western area of the county. This phase of the study



utilized standardized open-ended interview questions to gain an in-depth understanding of technology use for the participants. Merriam (1998, p. 19) cites research conducted by L. M. Smith (1978) that indicates that “case studies are differentiated from other types of qualitative research in that they are intensive descriptions and analyses of a single unit or bounded system.” A bounded system is an assemblage of interacting things or parts into a functioning whole. A bounded system has spaces, territories, with recognizable edges between the inside and outside, with different functions occurring in different spaces. Examples of a bounded system are an organization, a class in school, and a program (Merriam, 1998). The data collection provided a rich picture of the bounded system. The researcher collected data from artifacts, focus group interviews, and observations during a semester of instruction in the fall of 2009.

An invitation was sent to the study participants requesting that they select and take part in one of two focus group discussions. Eight participants joined the first focus group session held in the western area of the county and 10 participants joined the second focus group session held in the eastern area of the county. To provide some measure of anonymity, participants were asked to choose and write their pseudonym on a small table tent, placing it in front of them. The research and participants used pseudonyms during the focus group interviews. The researcher facilitated the focus group interviews and ensured that each remained consistent by using the same open-ended interview questions, setting ground rules for the focus group discussions, and allowing each participant as much time as necessary to respond. The researcher wrote notes while digitally recording both focus group sessions. The notes were used during the interviews as reminders for the researcher to ask participants to clarify or elaborate on statements made. The researcher subsequently uploaded the digital recording .wav files to a computer and stored the files on secure password protected external hard drive dedicated solely to the research study. To

ensure transcription accuracy, the researcher repeatedly listened to the uploaded.wav files to carefully transcribe the recordings verbatim.

The importance of the focus group interviews was to have participants expound on answers given in phase one on the survey, to clarify information collected from the observations and artifacts, and to share classroom technology experiences. It was important to know how the participants' hardware, software and online technology resources changed during the eight years of a rapid one-to-one technology initiative, and to explore their perceived level of technology use and integration. Their classroom technology stories provided rich and contextual data that contributed to the overall understanding of the participants' one-to-one laptop experience as it related to changes in their instruction and teaching strategies.

### **Data Analysis**

The researcher used a four-stage data analysis process. The stages occurred simultaneously and repeatedly and included the identification of the themes emerging from the raw data, devising an audit trail, re-examining the categories to determine how they are linked, and translating the conceptual model into a story (Strauss & Corbin, 1998).

To begin the analysis process the researcher compared the survey, observation, and focus group interview data to gain a greater understanding of the participant's one-to-one laptop initiative experiences over eight years. The researcher examined the collective data for commonalities and discrepancies among the participants with reference to the original research questions. Throughout the evaluation and analysis process, the researcher remained receptive to emerging insights. With its use of multiple data collection methods and analysis techniques, the case study provided opportunities to triangulate the data to strengthen the findings and conclusions (Yin, 2009).

After the first phase of data collection, descriptive statistics were generated for the online survey's technology integration indicators (McMillian, 2004). The main goal of this first phase of the study was to gather data that painted an overall picture of the participants' perceived level technology integration. Measures of central tendency were reported on overall levels of perceived levels of technology integration, and measures of dispersion were reported to determine the degree of variation in perceived levels of technology integration across the participants (McMillian, 2004).

Unannounced observations designed to capture a snap shot in time of teachers' routine classroom practices were conducted and relevant technology integration artifacts were collected for the 18 teachers selected. The researcher collected participants' technology use data from multiple observations on randomly selected dates and at random times for each participant. The researcher recorded the each observation on a single sheet of paper with sections for setting information and notes. The setting information included the teacher, school, grade level, course name, content area, setting (classroom or computer lab), time, and observation date. The descriptive notes included a brief description of content taught, description of the physical setting, and accounts of computer, Internet and video use. The reflective notes included speculation, impressions, and prejudices (Creswell, 2009). The researcher coded each observation using an alphanumeric designation to protect the participants' identities. The key to the alphanumeric codes was maintained on an external hard drive dedicated solely to the research study. The researcher analyzed the classroom observation data by finding commonalities of each participant across the two basic types of classroom settings, grade level, course and content taught with regard to instructional technology use. To triangulate the findings, observational and artifact data were added to the data collected from the electronic survey data.

The researcher conducted two focus group interviews after analyzing the electronic survey, observation, and artifact data. The researcher used content and context analysis to clarify and explore the deeper meaning of the survey, observation, artifact, and focus group interview data collected. Content analysis was the central technique that was used for each focus group interview to identify the categories and themes that the participants' responses presented.

The focus group data were digitally recorded and transcribed to assist the researcher in preparing the findings and analysis. The researcher uploaded the focus group recordings to a password-protected computer and stored the recordings on a secure password protected external hard drive. The research listened to the digital recordings and transcribed them verbatim by listening to the digital recording again for accuracy while reviewing each line of the transcription. Verbatim transcriptions of the digital recording provided a copy of the focus group experiences for the purpose of analysis (Maxwell, 1996; Silverman, 2000). The researcher used codes based on terms, phrases, keywords, key terms in phrases, and repetitive words found in the digital recording transcript data (Strauss & Corbin, 1998). The raw data were broken down into manageable segments or data chunks. All data chunks, including individual words and phrases judged by the researcher to be about the same theme or concept, were color coded by electronically changing the text to a unique color and placed in an electronic table (Maxwell, 1996). The researcher gave meaningful labels to the color-coded themes. The meaningful labels indicated the concept that supported the theme or category (Strauss & Corbin 1998). The researcher created new codes when a theme or concept did not fit the existing codes. The researcher sorted the data in a variety of different ways to expose or create new insights and intentionally looked for conflicting data to disconfirm the analysis (Stake, 1995; Yin, 2009). The researcher used the strategy process of constant comparison. Glaser and Strauss (1967) call this

type of qualitative methodology grounded theory. The researcher repeatedly asked the questions, “What are participants saying?” and “How does it differ from the previous statement?” (p. 55). To ensure coding was consistent, the researcher compared coded passages of text to new passages of text (Glaser, & Strauss, 1967).

Lincoln and Guba (1985, p. 319-320) point to Edward S. Halpern’s (1983) research that indicates that an “audit-trail or scheme for identifying these data chunks should be devised so that there is “a residue of records stemming from an inquiry.” The researcher used the participants’ quotes to illustrate the themes being described. Additionally, the researcher used the quantitative data collected to corroborate and support the qualitative data (Yin, 2009). Once themes and categories were identified and an audit trail was devised, the researcher compared and combined the categories in new ways to further explore and understand the data (Morse 1994, p. 230). The researcher built a conceptual model to determine whether sufficient data existed to support that interpretation (Morse 1994, p. 230). At the end of the study, the digital recordings were deleted from the external hard drive computer files and the back-up digital recordings deleted.

### **Assurance of Confidentiality**

Approval for the case study was obtained from the Director of Research and Planning for the large central Virginia school district (see Appendix G) and the Institutional Review Board for the Behavioral Sciences (IRB) of Virginia Commonwealth University prior to conducting the survey questionnaire and focus groups in the spring of 2009.

The participants’ identity remained confidential by using pseudonyms to assure anonymity. The participants’ information and research data collected was stored on an external hard drive dedicated solely to the research study and kept in a locked home office. The

participants were volunteers who read the outlined procedure of the case study and signed a consent form that also contained information regarding confidentiality (see Appendix H).

At the end of the study, the digital recording .wav files, transcript document, and database were deleted from the secure external hard drive. Participants' observation forms and artifact collection documents were destroyed. The researcher treated the evidence collected impartially to produce analytic conclusions that answered the original research questions (Yin, 2009).

### **Steps to Ensure Reliability and Trustworthiness**

According to Lincoln and Guba (1985), there are four constructs by which to ensure trustworthiness of a qualitative study: credibility, transferability, dependability, and confirmability. Credibility is an evaluation of whether or not the findings represent a credible conceptual interpretation of the data drawn from the participants' original data (Lincoln & Guba, 1985, p. 296). Transferability is the degree to which the findings can apply or transfer beyond the bounds of the study. Dependability is an assessment of the quality of the integrated processes of data collection, data analysis, and theory generation. Confirmability is a measure of how well the study's findings are supported by the data collected (Lincoln & Guba, 1985). These four terms are the "naturalist's equivalents for the conventional terms 'internal validity,' external validity,' reliability,' and 'objectivity'" (Lincoln & Guba, 1985, p. 301).

Credibility places parameters on the study. The researcher conducted the focus group interviews in such a manner that the subject was appropriately identified and described. To minimize potential bias and to help extend the findings, the researcher carefully constructed the interview questions so as to eliminate prejudice (Marshall & Rossman, 2006). Focus group interviews were conducted until data collected were at the point of saturation, and redundancy of any themes all emerged across the focus group sessions. The emerging categories were coded

and categorized into predominant categories. The researcher hand delivered a copy of the focus group interview verbatim transcription to each study participant to verify accuracy, and to add additional comments or clarification where appropriate. The researcher gave participants time to listen to the .wav file and read the transcriptions. The researcher invited the participants to answer follow-up questions to add additional information and clarity. Below are the questions that were asked of each participant

1. After listening to the digital recording and reading the transcript, do you believe what was captured is accurate?
2. Does the information in the transcript clearly convey your experiences?
3. Do you have any changes to make to the transcript?
4. What can/should be added to clarify your experiences?

Transferability tells us that the study is useful to others in a similar situation. Business and marketing teachers and the courses they teach are similar in nature in that their focus is preparing students for careers and success beyond secondary education. The purpose of the study was not to be generalized to larger populations because of the size of the study and nature of the participants; however, this study contributes to the data and information previously gathered from a teacher's perspective on technology initiatives, specifically large and rapidly deployed one-on-one laptop initiatives. The stories told are those of high school business and marketing teachers, therefore, the limited number of participants reduces the transferability to those whose who teach CTE in similar classroom settings.

Trustworthiness and reliability refer to dependability over time and across methods and researchers (Creswell, 2009; Lincoln & Guba, 1985; Miles & Huberman, 1994). Confirmability is a measure of how well the study's findings are supported by the data collected. To address the

issues of dependability and confirmability, the researcher employed a peer reviewer to independently audit the research methods and findings (Lincoln & Guba, 1985; Patton, 1990). Peer review was conducted by a doctoral graduate student. First, the reviewer listened to the focus group interview .wav file and compared it to the verbatim transcript. Second, the reviewer provided additional feedback on the coding procedures and methodology, and verified that the categories, subcategories and themes used correctly indicated the meaning of the participants' narrative. The peer reviewer prevented the reporting of irrelevant findings, unacceptable interpretations, and personal views. All unused collected data was permanently deleted and discarded.

### **Limitations**

This case study is ideographic in nature and as Yin (2003) suggests, the findings are not generalizable to a larger population but may be transferable to similar teachers in similar situations. Since the case study was in narrative form and was lengthy, it may present the issue of holding the reader's interest. Therefore, the researcher attempted to present the rich data in digestible portions. Case studies can be viewed as less rigorous than other research methods so, while conducting and writing the study the researcher used care by being systematic in data collection and took steps to ensure validity and reliability (Yin, 2009). The small size of the sample and narrow scope of business and marketing high school teachers were also limitations. One additional limitation was that of the researcher viewed as an instrument of interpretations.

Currently, the researcher is a curriculum specialist whose primary responsibilities are to lend curriculum, technical, and informational support business and marketing teachers. The researcher is also responsible for observing and evaluating instructional practices of those same teachers. The researcher's own educational experiences have sparked her interest in the probable



changes to business and marketing instructors' teaching methodology, level of technology skills, equipment usage and integration, curriculum alignment to career pathways and state standards, and classroom environments as a result of this eight-year technology integration.

The researcher's involvement in the technology deployment and implementation prepared her to conduct this study. In her last two years of teaching, the researcher was a part of the same one-to-one laptop initiative studied in this research. In her role as a marketing instructor, there were trials, tribulations, and profoundly exciting moments during this innovative and revolutionary laptop initiative that affected teaching methods, technology skills, classroom management and focus, and the students' overall classroom experience.

Because of her experience with laptop initiative, the researcher brought a unique perspective to the study. The researcher worked with many of the participants as a peer for more than 10 years and is now in an administrative position at the school division's central office supervising those same teacher-participants. The researcher had to disengage from the role of administrator and assume the role of researcher to conduct objective observations of teachers' technology use and integration. While conducting the study's observations, the researcher took great care to filter out personal biases and to describe rather than interpret the participants' technology use and integration.

The researcher was aware that past and current employment among the research group participants may carry prejudices that could influence the study; therefore the researcher carefully worded the focus group questions in ways that were nonthreatening, nonjudgmental, and did not lead the participants to a specific answer.

## **Discussion**

The results are depicted by two distinct strands, one quantitative and one qualitative, each with its own questions, data analysis, and inferences (Creswell & Tashakkori, 2007, p. 108). Quantitative data were collected in Phases one and two, while qualitative data were collected in Phase 3. The online survey was conducted during the first phase, followed by classroom observations and artifact collection in Phase 2. The qualitative data were collected during two focus group discussions of the 18 participants in Phase 3. The online survey, observations, and artifact data were gathered, quantified, and analyzed to gain a rich contextual understanding of the participants and to corroborate and augment evidence from the focus group (Yin, 2009). The online survey yielded demographic data and data regarding teachers' perceptions of technology use and integration. During the classroom observations, the researcher collected technology use and integration data and wrote short memos on the lessons taught. The artifacts gathered yielded data on the number and percentage of times specific technology was used. These combined data were used to substantiate the qualitative data gathered from the focus group discussions. Focus group interviews were digitally recorded and transcribed. Each focus group discussion was reviewed and transcribed. The second focus group transcription was combined to the end of the first transcription, thus creating one document. The transcript data were read in whole, judiciously examined and field notes added to the transcript margins. The combined transcript was evaluated and compared to the classroom observation and artifact data to develop a general understanding of the data in aggregate. To ensure the accuracy of the focus group transcription the researcher listened to the digital recordings several times and made adjustments as necessary.

## **Definition of Key Terms**

Key terms and unique acronyms used exclusively in the school district or specifically as well as additional technology terms and acronyms used throughout this research have been identified so that the reader has clear and unambiguous contextual information.

The following key terms are referenced in this study and defined below to facilitate the reader's understanding of the terms in the context of the study.

**Advanced computer information systems (ACIS).** A business class that teaches students to apply problem-solving skills to real-life situations through advanced integrated software applications (Virginia CTE Resource Center, 2010a)

**Advanced design multimedia and web technologies (ADMWT).** A business course that teaches students to develop advanced skills in creating interactive media, web sites, and publications for print and electronic distribution (Virginia CTE Resource Center, 2010b).

**Blackboard Inc.** "Blackboard Inc. develops and licenses software applications and related services to over 2200 education institutions in more than 60 countries. These institutions use Blackboard software to manage electronic learning, transaction processing and e-commerce and online communities" (Wikipedia Organization, 2010b).

**Blog.** A contraction for the term "web log." A blog is a web site that is typically maintained by one individual who provides commentary and who elicits comments from individuals visiting the web site (Blood, 2000).

**Career and technical education (CTE).** Formerly known as vocational education, CTE prepares students for careers as well as for college. Traditionally, CTE was designed for the nonacademic student who was interested in a specific trade, occupation or vocation (Dare, 2006).

**Computer information systems (CIS).** "Students apply problem-solving skills to

real-life situations through word processing, spreadsheets, databases, multimedia presentations, and integrated software activities” (Virginia CTE Resource Center, 2010a).

**Competency-based education (CBE).**

CBE is an institutional process that moves education from focusing on what academics believe graduates need to know (teacher-focused) to what students need to know and be able to do in varying and complex situations (student and/or workplace focused). CBE is focused on outcomes (competencies) that are linked to workforce needs, as defined by employers and the profession. CBE’s outcomes are increasingly complex in nature, rather than deriving from the addition of multiple low level objectives. CBE often necessitates more complex assessment, involving portfolios, experiential learning assessment in field experience, demonstration in varying contexts, role play, use of standardized patients or clients, etc” (Council on Education for Public Health, 2006).

**Audacity.** Free, open source software for recording and editing sounds. It is available for Mac OS X, Microsoft Windows, GNU/Linux, and other operating systems (<http://audacity.sourceforge.net>).

**CTE task and competencies.** Career and technical education designated tasks and competencies that are essential for each student to achieve when enrolled in a CTE course.

**Comprehensive school improvement plan (CSIP).** Acronym used by the school district to reference the Comprehensive School Improvement Plan.

**Digital age.** The era of information technology. Also referred to as the information age (Metiri Group, 2001, p. 5).

**Digital divide.** The difference between those with access to modern information technology and those without (Bickner, 2001).

**Discussion boards.** An electronic message board or Internet forum, it is a bulletin board system where Internet visitors can view contents and contribute or submit topics for discussion. Each message or posting is known as thread.

**Design multimedia and web technologies (DMWT).** “Students develop proficiency in creating desktop publications, multimedia presentations/projects, and web sites using industry standard application software” (Virginia CTE Resource Center, 2010b).

**Drop box.** A term used by the school district that describes a secure electronic file located inside the Virtual Share folder and accessed by either students or teachers.

**Electronic media.** That which is posted electronically over the Internet.

**FileMaker Pro.** A cross-platform relational database application from FileMaker Inc., formerly Claris, a subsidiary of Apple Inc., it integrates a database engine with a graphical user interface-based (GUI-based) interface, allowing users to modify the database by dragging new elements into layouts, screens, or forms.

**iBook.** The Apple Computer, Inc.’s laptop computer sold between 1999 and 2006 primarily to consumer and education markets with lower prices and with fewer features than PowerBook.

**Internet and computing core certification (IC<sup>3</sup>®).** This certification provides students and job seekers with the foundation of knowledge they need to succeed in environments that require the use of computers and the Internet.

**International Society for Technology in Education (ISTE).** A nonprofit membership organization dedicated to the effective use of technology in grades spanning prekindergarten through 12<sup>th</sup> grade.

**Interactive white board.** A large flat white touch-controlled screen mounted to the front of a classroom or auditorium it acts as a monitor and input device that interacts with a LCD video projector beam and computer. It is used to project what is on a small computer screen to a large screen visible to classroom or auditorium members. Instructors or students utilize a stylist

to write on or drag objects on the screen. Or they can use a remote is to advance slides or pages.

There are several manufacturers of interactive white boards; however, the Promethean Board® is the only one that the school district's Technology Department service and support.

**Instructional technology resource teacher (ITRT).** The term instructional technology resource teacher was developed by the Virginia Department of Education. There is to be one ITRT for every 1,000 public school students in the Commonwealth of Virginia. The goal of the ITRT is to assist teachers with the integration of technology into the classroom (Virginia Department of Education, 2007c).

**Link.** An online program provided by the school district so parents and students have easy access to homework assignments, class grades, attendance and school/district notices.

**LCD video projector.** Liquid crystal display projection beam used in classrooms to project.

**Microsoft office specialist (MOS).** The credential required by academia and business. It is recognized globally as the premier credential used to validate the user's Microsoft Office systems knowledge, skills, and abilities.

**Net-generation.** People born between the years 1979-1994. These people are also referred to as Generation Y or Millennials (Cheese, 2008).

**National Educational Technology Standards (NETS)** developed by the International Society for Technology in Education.

**NETS for students.** National Educational Technology Standards for students.

**NETS for teachers.** National Educational Technology Standards for teachers.

**NetTech.** A term used by the school district that refers to network technicians. NetTechs are responsible for the efficiency of the school division's wireless and cabled (Ethernet) network connectivity.

**Portable Document Format (PDF).** An open standard for document exchange. The file format created by Adobe Systems is used for representing two-dimensional documents in a manner independent of the application software, hardware, and operating system.

**Carl D. Perkins Vocational and Technical Education Act 2006 (Perkins IV).** The new act "provide[s] an increased focus on the academic achievement of career and technical education students, strengthen the connections between secondary and postsecondary education, and improve state and local accountability" (U. S. Department of Education, 2010).

**Podcast.** A series of audio or video digital media files distributed via the Internet. The syndicated files can be automatically downloaded to personal computers and portable media players.

**Programming.** "Students explore computer concepts, apply logic procedures, and implement programming procedures with one or more languages, such as Visual Basic.Net, Java, C#, and C++" (Virginia CTE Resource Center, 2010c).

**School space.** The school district's learning management system.

**Share folder.** Each teacher and administrator has a unique folder called a Share Folder that resides within his/her electronic Drop box. The Drop box is a folder that resides within the teacher's or administrator's Virtual Share folder on one of the school division's servers. The purpose of the Share Folder is so that anyone given a username and password can open it and have access to its contents.

**Student competency records (SCR).** The student competency record provides a means for keeping track of student progress. The CTE teacher assigns a rating for classroom competency achievement.

**Technology integration progression chart (TIPC).** This chart has six components that were derived from and based on the National Educational Technology Standards.

**Technology standards for instructional personnel (TSIPS)**

**TST.** An acronym the school district uses to describe technology support technicians. TSTs are employees whose duties included technical assistance and support for teachers', administrative staffs' and students' laptops.

**Twenty-first century skills.** The skills, knowledge and expertise students should master to succeed in work and life in the 21<sup>st</sup> century.

**Quia.** A Web site accessed by teachers to create online tests, quizzes, games, and surveys.

**Ubiquitous computing.** Known as ubicomp, pervasive computing or ambient intelligence. The information processing that has been integrated into everyday objects and activities. Ubiquitous computing engages many computational devices and systems simultaneously, in the course of ordinary activities.

**Virginia Standards of Learning (SOL).** “The Standards of Learning for Virginia Public Schools describe the commonwealth’s expectations for student learning and achievement in grades K-12 in English, mathematics, science, history, and social sciences, technology, the fine arts, foreign language, health and physical education and driver education” (Virginia Department of Education, 2010d).



**Virtual Share:** A term used in the school district that is an electronic method of exchanging and sharing files used by administrators, teachers, and students. The Virtual Share folder is located on the intranet server of each school or central office location.

**Vodcast.** A video podcast also known as a vodcast is a term used for the online delivery of video on demand video clip.

**WebQuest.** “A WebQuest is an inquiry-oriented lesson format in which most or all the information that learners work with comes from the web” (“Webquest.com,” 2010).

**Wiki.** A wiki is a web page or Web pages designed to enable anyone who accesses it to contribute or modify content. Wikipedia.org is an example of a wiki (Mitchell, 2008).

**Wireless environment.** An environment (school/business/public library) that provides Internet connectivity via a wireless router. A wireless component must either be imbedded within the computer in use or the computer must have a wireless external adapter in order to utilize the wireless capabilities offered at a school, business, or public library. Wi-Fi or “wireless fidelity” is a term commonly used to describe a wireless environment.

## **CHAPTER 4. PRESENTATION OF FINDINGS**

The principal guiding question for this study was: What effect has a comprehensive, one-to-one laptop initiative had on business and marketing high school teachers' technology skills and technology integration? Additional questions explored included:

1. How has technology (hardware-software) affected the business and marketing classrooms' learning environment?
2. What technology was used routinely by business and marketing teachers today that was not used a in a classroom eight years ago?

Chapter 4 includes the quantitative and qualitative results and a narrative analysis of the common themes.

To answer those questions, a three-phase representative case study design was employed by collecting quantitative and qualitative data of 18 participants, all teachers in business and marketing in the laptop initiative. Lessons learned from the case study are assumed to be informative about the experiences of the average person (Yin, 2009). The case study results are not generalizable and may be difficult to replicate. Prospective researchers may not have the same access to or relationship with the same participants, and if other participants are used, results may differ. The quantitative data were used to gain a greater contextual understanding of the qualitative data gathered (McMillian, 2004). Based on the results, meaningful inferences have been made from each strand, and validation procedures reported (Creswell & Tashakori, 2007).

### **Quantitative Strand, Phase 1: Electronic Survey Analysis**

Participants were asked to answer ten questions on an electronic survey. The results helped provide background context of the teacher-participants and their perceived instructional technology use and integration. The overall descriptive result numbers and percentages for the ten items appearing on the online survey were presented in Table 1 in Chapter 3.

All high school students in the school district are issued a wireless laptop computer; therefore, whether a student is taught in a classroom with or without desktop computers, the student has daily access to a wireless laptop computer and teachers' electronic share folders and drop boxes. However, classrooms with desktop computers are connected by Ethernet, allowing students to access a printer dedicated to that classroom. Additionally, specific software needed for the skills-based classes is loaded on desktop computers; so, students utilize desktop computers and the dedicated printers while in a skills-based class. Examples of skill-based classes are keyboarding applications, introduction to computer applications, computer information systems, and programming. Students use wireless laptop computers in classrooms with and without desktop computers but are unable access specific software or print to the dedicated classroom printer. Table 2 in Chapter 3 summarized how the participants categorize what they teach.

Table 5

*Participants' Demographics and Professional Profile*

Participant	M/F	Teaches in Classroom or Lab	Degree(s) Held	Years Taught in District	Endorsements, Certifications, and National Board Certified Teacher (NBCT)
Alicia	F	Lab	B.S.	23	Business Education
Annie	F	Lab	B.S., M.Ed.	15	Business Education, MOS
Bridgett	F	Lab	B.S.	12	Business Education, MOS
Dee Dee	F	Lab	B.S.	27	Business Education, NBCT
Eileen	F	Lab	B.S., M.Ed.	30	Business Education, NBCT
Ellie	F	Lab	B.S.	15	Business Education, NBCT, IC <sup>3</sup> ® and MOS
Jake	M	Lab	B.S.	18	Business Education, IC <sup>3</sup> ® and MOS
Louise	F	Lab	B.S., M.Ed.	16	Business Education, NBCT, IC <sup>3</sup> ® and MOS
Lucy	F	Lab	B.S.	28	Business Education, MOS
Maggie	F	Lab	B.S.	31	Business Education, MOS
Rita	F	Lab	B.S., M.Ed.	18	Business Education, MOS
Robbie	M	Classroom	B.S.	18	Marketing Education, Customer Service
Rose	F	Classroom & Lab	B.S.	23	Business Education, MOS
Sterling	F	Classroom	B.S., M.Ed.	16	Marketing and Business Education, Instructional Technology Customer Service and Sales
Taylor	F	Classroom	B.S., M.Ed.	31	Marketing Education, Customer Service and Sales
Thelma	F	Lab	B.S.	14	Business Education, IC <sup>3</sup> ® and MOS
Tori	F	Classroom	B.S.	24	Marketing Education, Customer Service Sales
Wally	F	Classroom	B.S.	18	Business Education, Customer Service and Sales

As part of the online survey, participants were asked to choose 1 of 7 statements in each category that best described their level of technology integration based on the Technology Integration Progression Chart standards. There were four basic categories: classroom learning space organization, digital organization, electronic resources, and support of student-centered learning. The classroom learning space organization category was divided into subcategories: physical layout and technology equipment used. The digital organization category was divided into subcategories: information management and content delivery. The electronic resources category was divided into subcategories: instruction and assessment. Each level represented levels of technology integration of the participants with the ideal level (7) as the goal. Entry level technology integration was level 1. Level 2 represented integration between entry and developing levels. Level 3 was the developing level. Level 4 represented integration between developing and approaching level progress. Level 5 was the approaching level with level 6 representing integration between approaching and ideal level. Level 7 corresponded to the ideal level of integration. To gain better understanding of the levels in each categories, see Appendix K for the comprehensive Technology Integration Progression Chart standards.

Figures 2-8 graphically summarize the participants' responses to online survey statements with technology integration levels that directly correspond to the school division's Technology Integration Progress Chart (TIPC) standards. Appendix D summarizes participants' survey responses. Subsequent to figures 1-7, Table 6 displays the means and standard deviation for each response.

Figure 1 represents participants' perceived organization of learning space. Entry level (1) on the TIPC Standards chart indicates that the participant does not consider the organization or

arrangement of the classroom for the use of student laptops. The ideal level (7) indicates that the teacher dynamically configures the classroom for instruction so that transitions are seamless.

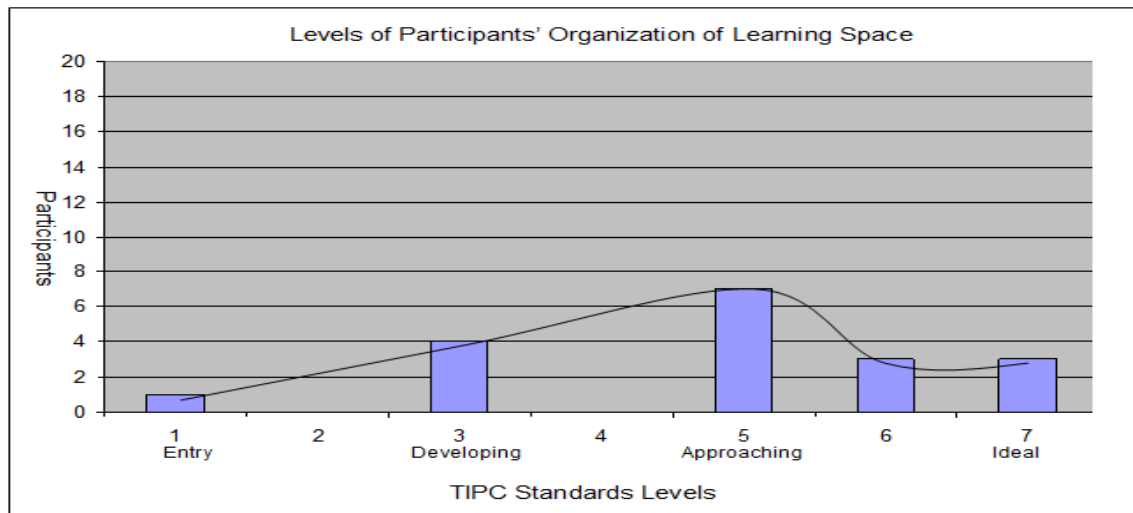


Figure 1. Participants' perceived level of organization of learning space.

Most participants (13) perceived that they were between the *approaching* and *ideal* levels of progress for the organization of learning space. After eight years of a one-to-one laptop initiative on three business and marketing participants, 16.7% perceive that they are at the *ideal* level of progress for the organization of learning space.

Figure 2 represents the participants' perceived level of organization of equipment used for teaching. Entry level (1) indicates that the participant does not use available projection equipment. Level 7 or *ideal* level of progress indicates that the participant had her students use available projection devices for interactive instruction when appropriate.

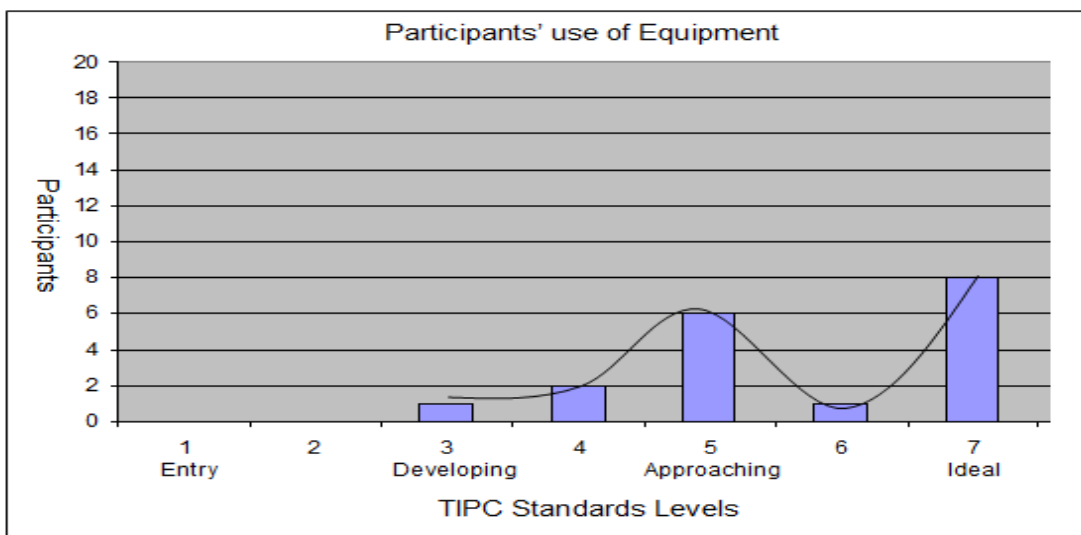


Figure 2. Participants' perceived level of equipment use for teaching.

Figure 3 indicates the perceived use of equipment participants have available for instruction based on the TIPC standards. One participant indicated his or her perceived equipment use for teaching was at the *developing* level. Examples of the *developing* level include that students use electronic resources selected by the teacher, students observe teacher demonstrate the use of electronic devices to manipulate static data, and teachers introduce technology based on cooperative learning strategies. One participant indicated his or her perceived equipment use for teaching was between the *developing* and *approaching* levels. Eight of the 18 participants indicated they and their students use available projection devices and six use available projection equipment for interactive instruction. Of the 18 participants 15, or a total of 83.3%, perceive they are either *approaching* the ideal level of progress or at the *ideal* level of equipment use for instruction after eight years of a one-to-one laptop initiative.

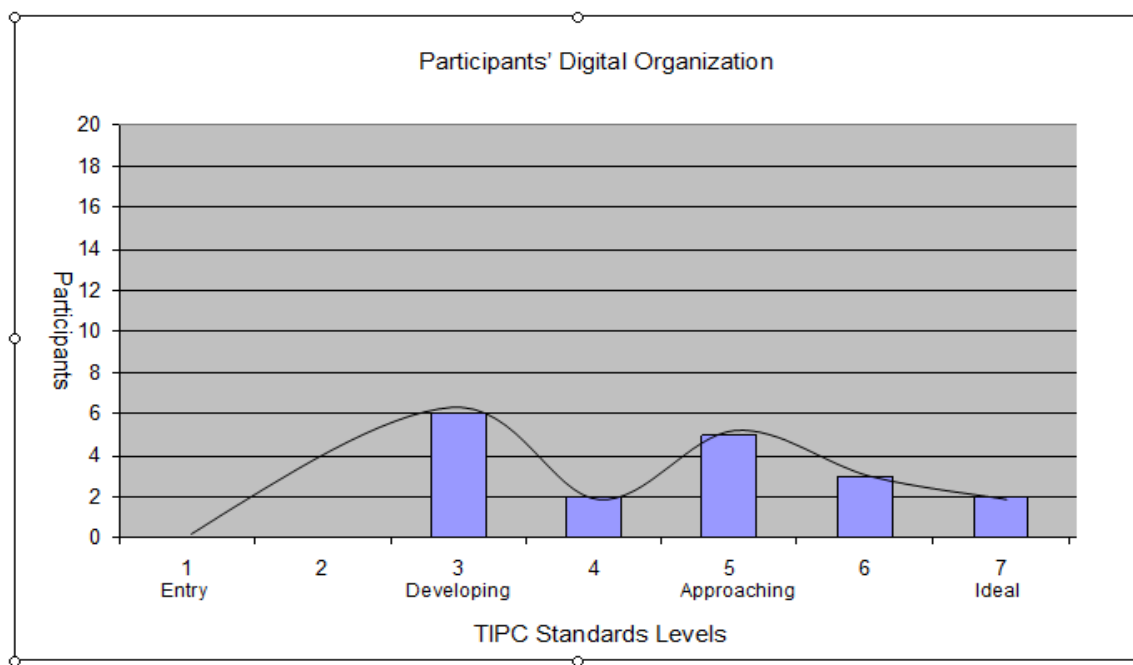


Figure 3. Participants' perceived level of their digital organization.

Figure 3 represents participants' digital organization of files and documents. Entry level of progress (1) indicates that the participant organizes all of her files, documents, tests, and quizzes in a traditional file cabinet. The ideal level of progress (7) indicates that the participant encourages her students to create and maintain digital organizational systems including electronic calendars and folders

Six of the 18 participants are at the *developing* level of progress since they indicated they still organize their files, documents, tests and quizzes in a traditional file cabinet while only storing some electronically. Two participants indicated they were somewhere between the *developing* and *approaching* levels of progress while five participants' perceived their level of progress to be *approaching* the ideal of organizing files and documents electronically. Two participants indicated they were at the *ideal* level of progress for digital organization since they encouraged students to create and maintain digital organizational systems including electronic



calendars and folders. Ten participants (55.5%) perceived they were between *approaching* and *ideal* levels of progress for digital organization.

Figure 4 represents the participants' perceived level of digital content delivery and resources used for teaching. Entry level of progress (1) indicates students maintain paper and pencil notes and that the teacher distributes hard copies of all documents to students. The ideal level of progress (7) indicates the participant uses electronic resources to distribute, collect, and return a variety of digital content and digital feedback is provided to students.

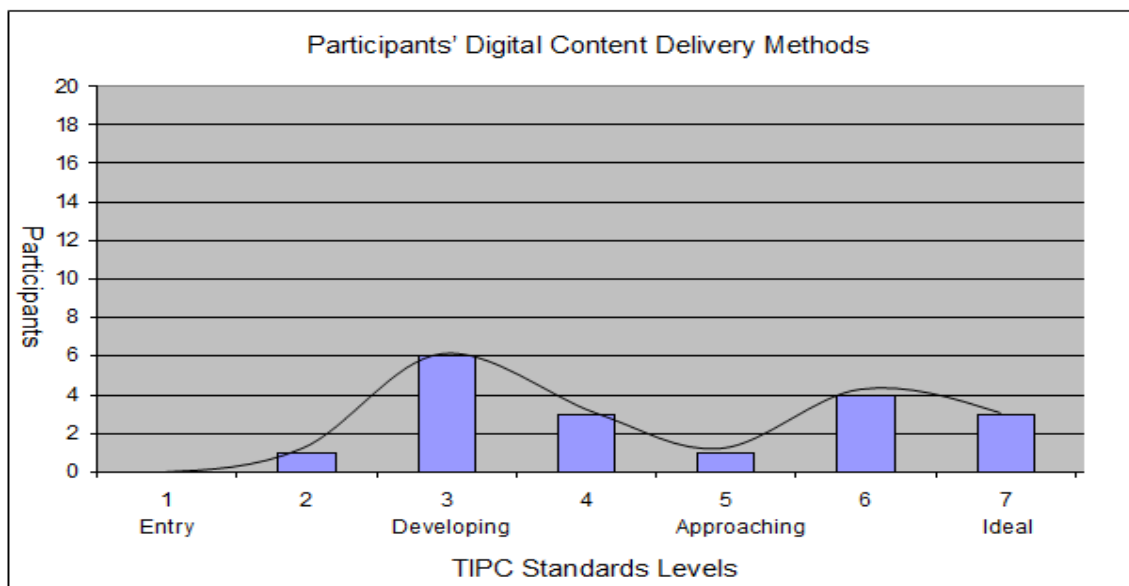


Figure 4. Participants' perceived level of digital content delivery and resources.

The data were spread out across the participants. One, or 5.5%, of the participants were at the *entry* level of progress for digital content delivery since 6 of the 18 participants, or 33.3%, perceived they were at the *developing* level of progress of content delivery since their students used word processing to take notes and the participant used available electronic resources to distribute documents to students. A combined seven participants (38.9%) perceived they were either moving from *approaching* idea progress to the *ideal* level of progress of content delivery.

Figure 5 represents participants' electronic resources used for instruction. Entry level of progress (1) indicates the participant uses print resources exclusively while the ideal level of progress (7) indicates participants develop their own electronic resources and lessons as well as incorporate open-ended questioning and higher order thinking skills in real world, technology-rich learning experiences.

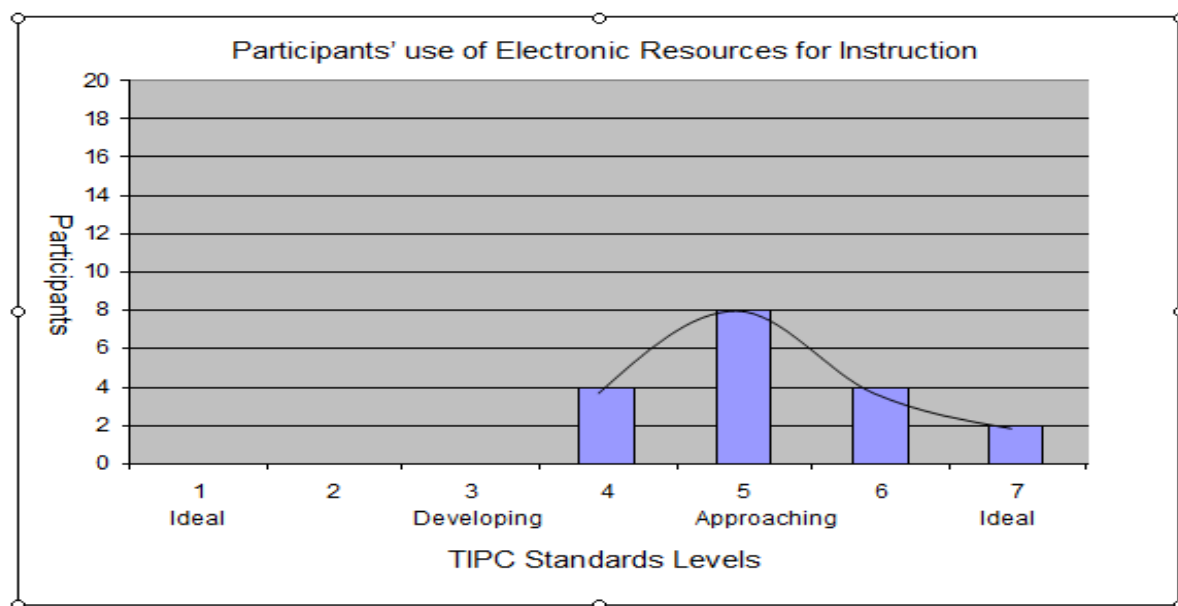


Figure 5. Electronic resources used for instruction.

Participants were asked to select the statement that best described their use of electronic resources for instruction. Eight of the 18 participants (44.4%) indicated they were at the

*approaching* ideal level of progress for electronic resource use. Four participants indicated they were moving from the *approaching* level to the *ideal* level of progress while two participants perceived that they were at the *ideal* level of progress for electronic resource use for instruction. Combined, 14 of 18 participants, or 77.7%, perceived their level of electronic use for instruction to be between the *approaching level* and the *ideal level*.

Figure 6 represents participants' use of electronic resources for assessment. Entry level of progress (1) indicates participants assess students using hard copy documents. Level 7 or the *ideal* level of progress indicates participants create, align and administer a wide variety of online assessments and facilitates student development of an electronic portfolio of assignments and projects to assess learning.

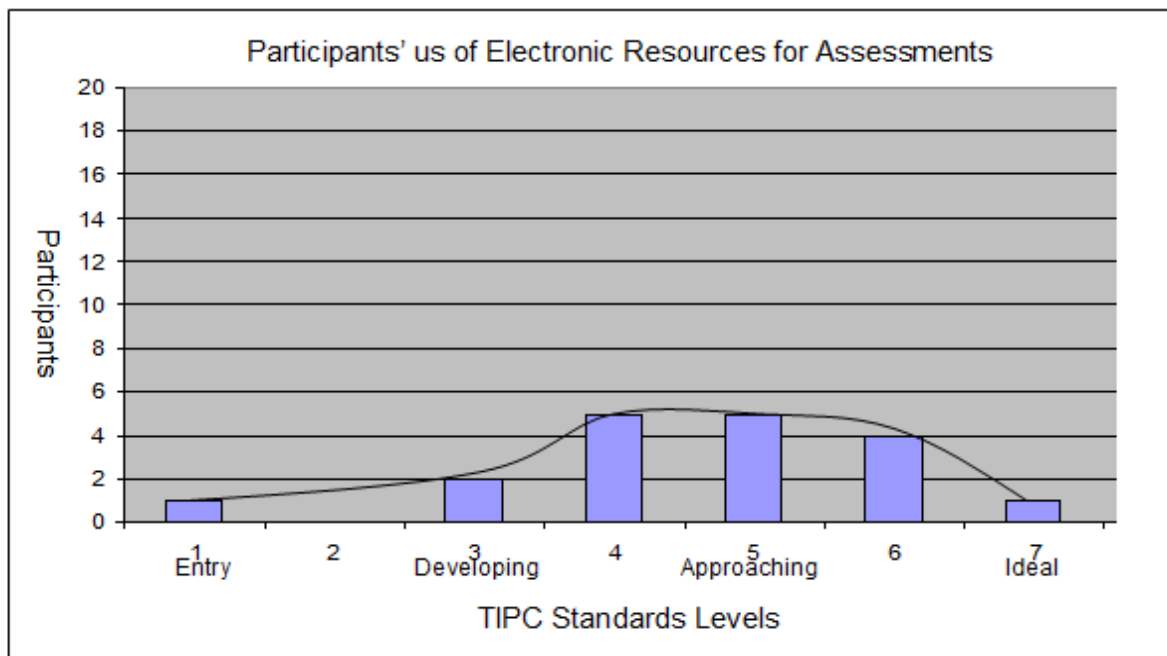


Figure 6. Electronic resources used for assessment.

Participants were asked to select a statement that best described their use of electronic resources for assessment. Five participants (27.8%) indicated that they were between using pre-made textbook publishers' assessment tools and creating their own electronic assessment instruments, while five participants (27.8%) indicated that they did create, align and administer online assessments. Four participants (22.2%) perceived they were moving from the *approaching* ideal level to the *ideal* level of progress of electronic resources use for assessment; whereas one participant had reached the *ideal* level of progress.

Figure 7 represents participants' support of student-centered learning. Entry level of progress (1) indicates students use technology is optional and students communicate learning through standard written and oral means. The ideal level of progress (7) indicates students use electronic resources to plan, design and execute solutions to real-world problems. Students engage in technology-dependent learning that is project-based, using open-ended questions and higher order thinking skills.

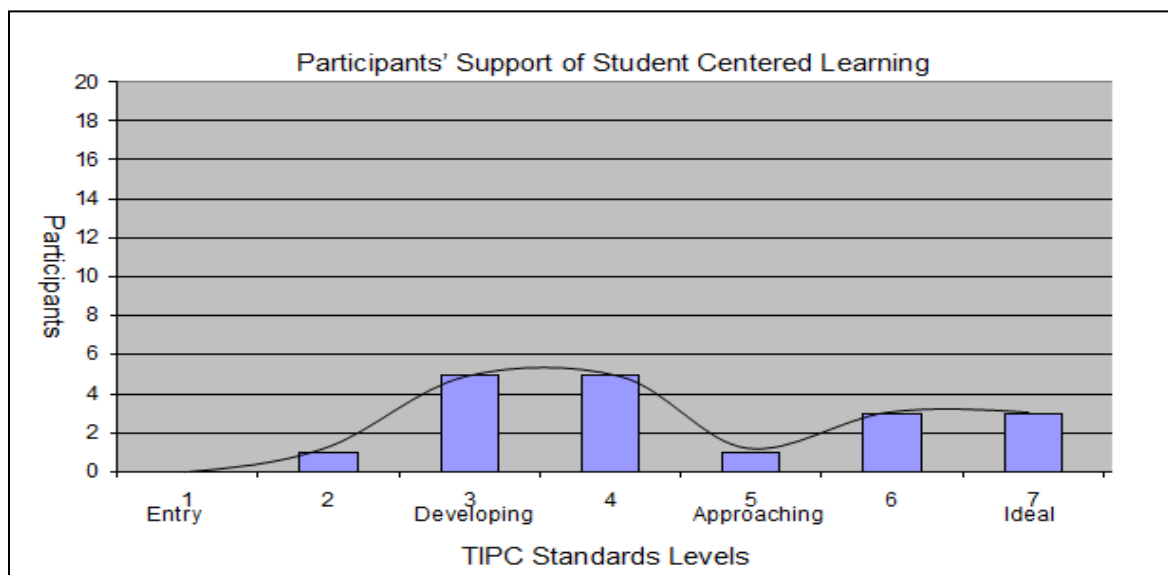


Figure 7. Support of student-centered learning.

Participants were asked to select the statement that best described their support for student-centered learning. No participants reported they were at the *entry* level of progress for student-centered learning. One, or 5.5%, of the participants was between the *entry* and *developing* levels of support for student-centered learning. Five of the 18 participants (27.8%) indicated they were at the *developing* level of progress of creating a student-centered learning environment with five additional participants, or 27.8%, who indicated they were between the *developing and approaching* levels of progress. Three participants, or 16.7%, perceived they were between the *approaching* and *ideal* levels of support for student-centered learning. Three participants (16.7%) perceived they were at the *ideal* level where their students used electronic resources to plan, design and execute solutions to real-world problems, and engage in technology-dependent learning that was project-based with open-ended questions and higher order thinking skills. After eight years of a one-to-one laptop initiative, seven participants (38.9%) perceived they were between the *approaching* and *ideal* levels of support for student-centered learning.

In summary, the online survey data indicated that the participants were comfortable using available projection equipment for interactive instruction. And although participants still used traditional methods for organizing and storing files and documents, 66.7% or 12 participants, were moving from traditional to electronic organizational systems. Eight of the 18 participants (44.4%) indicated that they used a variety of digital content delivery methods with three participants, or 16.7%, who indicated electronic resources were used to distribute, collect, and return a variety of digital content. Fourteen participants (77.8%) indicated they either frequently used textbook materials with technology resources or that they developed their own electronic

resources. According to the survey results, participants use technology for instruction but do not put great emphasis on the organization of learning space or integrate technology use in a student-centered learning environment.

Table 6 combines the means and standard deviations data from Figures 1-7, which summarized the participants' responses to online survey statements that represent technology integration levels that directly correspond to the school division's Technology Integration Progress Chart (TIPC) Standards.

Table 6

*Eighteen Participants' Perceived Levels of Technology Integration and Use*

	Mean	SD
Digital organization for content delivery	4.56	1.69
Organization of learning space	4.83	1.65
Support of student-centered learning	4.50	1.62
Digital organization	4.61	1.42
Electronic resources used for assessment	4.61	1.42
Equipment used for instruction	5.82	1.29
Electronic resources used for instruction	5.22	.94

Standard deviation is a statistic used to determine how spread out the data in a sample are and how close individual data points are to the mean value of the sample. A low standard deviation indicates that the data points tend to be very close to the mean, whereas high standard deviation indicates that the data is spread out over a large range of values. For participants'

digital organization for content delivery the mean value was 4.56 with a standard deviation of 1.69. The participants' perceived level of organizational learning space mean value was 4.83 and 1.65 was the standard deviation. Especially notable is that the perceived level of digital organization for content delivery and their perceived level of organizational learning space. Both had high standard deviations indicating data are spread out over a large range of values so, for those scales, there is great variability across the teachers. For the 18 for the participants' perceived level of support for student-centered learning the mean was 4.50 with a standard deviation of 1.62. It, too, had a high standard deviation indicating great variability across teachers. For participants' perceived level of electronic resources use for assessment and for digital organization their perceived level of digital organization the mean value was 4.61 with a standard deviation of 1.42. On the "equipment used for instruction" scale, across the 18 participants, the mean value was 5.82 and standard deviation was 1.29. The mean value for participants' electronic resources used for instruction was 5.22 and .94 was the standard deviation indicating data was not spread out over a large range of values so, there is a small variation among teachers.

Once the online survey was complete the researcher conducted classroom observations and collected relevant educational artifacts of the 18 participants.

### **Qualitative Strand, Phase 2: Classroom Observation and Artifact Data Analysis**

The observation and artifact data results were used to provide additional background context while gaining a greater understanding of the participants' lived technology classroom experiences and perceived instructional technology use and integration. In the second phase of the study, 18 participants were observed teaching four times each during a span of two months for a total of 72 observations. The unannounced observation times and days were chosen so that

the researcher could observe a variety of classes for each participant while noting and recording the technology used and level of technology integration implemented. The observation data were documented during each visit and the results help provide background context of the teacher-participants and their perceived instructional technology use and integration. Short memos were also recorded on the observation form, “becoming an important first step in forming broader categories of information, such as codes or themes” (Creswell & Plano, 2007). The observation and artifact data results were also used to provide background context while gaining a greater understanding of the participants’ lived technology classroom experiences and perceived instructional technology use and integration.

Table 7 summarizes the number of different types of technology used and the percentage of use by 18 participants during the 72 classroom observations.



Table 7

*The Number and Percent of Technology Used Based on 18 Participants and 72 Observations*

Observed Technology Used	18 Participants Who Used Technology		Technology Use During 72 Observations	
	N	%	N	%
Research	7	38.8	12	16.7
Writing/Word Processing	6	33.3	12	16.7
Drill and practice	6	33.3	10	13.9
Spreadsheets	5	27.8	6	8.3
Online course materials	5	27.8	6	8.3
PowerPoint presentations	4	22.2	8	11.1
Simulations	4	22.2	4	5.5
Graphing	3	16.7	3	4.2
Tutorials	3	16.7	4	5.5
Graphics	2	11.1	2	2.8
Emailing	1	5.5	1	1.4
Video original presentation	1	5.5	1	1.4
Distance learning	1	5.5	1	1.4
Voice threads	1	5.5	1	1.4
Video watching	1	5.5	1	1.4
Online survey	1	5.5	1	1.4

During the 72 observations, a wide range of technology was observed across and between classrooms. As noted in Table 7 online research, word processing, and drill and practice were observed most frequently, whereas distance learning, voice threads and online surveys were observed less frequently confirming the survey data collected for electronic resources use for instruction.

Seven of 18 participants (38.8%) had students using the Internet as a tool for research. Six of the 18 participants, or 33.3%, had students using word processing for student assignments during class time. Six participants (33.3%) utilized drill and practice software for student learning. Five participants (27.8%) utilized a spreadsheet application for teaching and student assignments. Five of 18 participants, or 27.8%, were observed utilizing online course materials as an instructional tool. Four of 18 participants, or 22.2%, was observed utilizing slide show software for instruction and students assignments. Four participants (22.2%) made use of technology simulations for instruction. Three (16.7%) of the participants were observed using the graphing feature in the spreadsheet software loaded on computers for instruction and student assignments. Three participants (16.7%) were observed using digital textbook and online tutorials for student learning. Two participants (11.1%) were observed utilizing graphics as part of their instruction and student learning. One participant (5.5%) was observed using Elluminate®, an online distance learning tool. One participant (5.5%) utilized original video presentations as a learning tool. Other Internet technology was observed that was beyond the standard selection on the observation form. One (5.5%) of the participants had students creating voice threads as a learning tool and one participant (5.5%) had students creating and answering an online survey as part of their instruction.

The researcher found that the more advanced use of technology was concentrated among a small number of participants, also confirming survey data collected. To illustrate, online research was used as a classroom tool 12 times or during 16.7% of the classroom observations. Student research included the subjects of business law, marketing, keyboarding, financial literacy, and principles of business and marketing. Examples of online research in business classes included research on peaceable assembly, Supreme Court decisions in cases involving the Bill of Rights, 21<sup>st</sup> century technology used for learning, prices of items included in a personal budget, and ergonomics affect on keyboarding. Examples of online research in marketing classes included research on business plans requirements and Strengths, Weaknesses, Opportunities, and Threats (SWOT) analyses; product plan requirements for a company that expanded too quickly; stock market symbols and prices in preparation to play the Stock Market game. Notably, the teacher whose students researched court cases also required students to create voice threads with graphics to share. Additionally, during a subsequent observation, that same teacher required students to research 21st century technology and employed distance learning using Elluminate® to remotely connect with a marketing and a business class at another school to discuss their findings. One marketing teacher required students to create a simple online questionnaire and to survey 10% of the junior class (40 students) on product preferences using [www.SurveyMonkey.com](http://www.SurveyMonkey.com). The lesson included the explanation of data collected and simple statistical analysis.

Although drill and practice was used as an instructional tool 10 times or for 13.9% of the observations it was used for keyboarding classes. Keyboarding is a basic skills class where drill and practice is required for students to practice repetitive key strokes for proficiency. Slide shows presentations were observed during eight visits for 11.1% of the observations.

The PowerPoint presentations were created by textbook publishers as teacher resources projected using the teacher's laptop and LCD beams. These presentations were used to augment a lecture in a teacher-centered class. Slide show presentations designed for student note taking supplant overhead projectors once used in teacher-centered classes.

Distance learning, emailing, video presentations, voice threads, and an online survey represent four teachers' technology use and were observed once each during the 72 observations, or each 1.4% of the time. It is important to note that only one participant employed online research with either distance learning or voice threads. One participant was observed using the television to broadcast an instructional video to her students for 1.4% of the 72 observations.

Based on the 72 observations teachers employed technology for research, word processing and drill and practice more often than distance learning, online applications (voice threads), or student email.

It should be noted that 12 participants taught in a room with desktop computers (computer lab) while 6 participants taught in classroom without desktop computers. Participants who taught in a computer lab had students use the desktop computers for instruction. Desktop computers employ Ethernet cables rather than wireless hubs affording students faster and more reliable Internet connectivity. Participants who taught in computer labs taught skills classes such as keyboarding, accounting, and computer information systems. Students taught in computer labs were observed performing drill and practice tasks, manipulating spreadsheets, graphs, graphics, word processing documents, and online research.

Student laptops with wireless Internet access were utilized in classrooms without desktop computers. Marketing, business law, business management, and financial literacy classes were taught in those classrooms. Students were observed creating voice threads, and manipulating

graphics, creating word processing documents, performing online research and creating online surveys.

All participants used their laptops and the available modern technology tools for content delivery to either project and demonstrate accounting ledgers or spreadsheets, display graphics, show textbook publishers' slide show presentations, websites, course materials, or tutorials. Participants had replaced outdated technology with contemporary technology but had not replaced traditional teacher-centered teaching with more innovative student-centered learning.

Additionally, throughout the two-month observation process the researcher noted and recorded each participant's level of technology integration implementation during their four observations. The observation instrument used was developed by the school division's Instructional Technology Resource Teachers (ITRTs) and is the same instrument used throughout the county to assess teachers' level of technology integration. Exemplary (E) indicated that the observed technology integration implementation was judged to be of high quality; (A) indicated acceptable or satisfactory quality; (I) indicated ineffective or inadequate technology integration implementation quality; and (N/O) indicated that technology integration implementation was not observed.

Table 8 and Figure 8 represent the observed number and percentage of times participants reached a level of technology integration and the number and percentage of times technology integration was not observed.

The data were collected during the 72 observations. Each participant was observed four times during a two-month span of time. During the 72 observations, 20.8% of the time participants' planning and organization of technology rose to the level of exemplary, while 27.8% of the time technology planning and organization was not observed. During 16 visits, or

during 22.2% of the observations, participants' computer activities demonstrated a natural application and a logical connection to the curriculum rose to the level of exemplary, while during 22.2% of the time or for 16 observations, computer activities were not observed. During 18 visits or 25% of the observations, participants' reached the exemplary level of monitoring student work at the computer and offering assistance when needed; yet 45.8% of the time technology was not used and, therefore, was not observed. When technology lessons were observed, 51.4% of the time lessons were clear so the participant rose to the exemplary level. In 28 of 72 observations, lessons were acceptable for a total of 38.9%.

When the observational data were considered by implementation level, some results for technology integration are striking. Twenty-five percent of the time the researcher observed technology integration was moving from a traditional teacher-directed classroom to an interactive student-centered classroom at the exemplary or acceptable levels. Conversely, 75% of the time technology integration was moving from a traditional teacher-directed classroom to an interactive student-centered classroom at the ineffective level or not observed. Additionally, 12.5% of the time the teacher promoted a collaborative and cooperative learning environment, contrasting with 87.5% of the time collaboration and cooperation was not observed. From the observations participants were able to set clear technology lesson objectives, but during an overwhelming majority of time participants (87.5%) were unable to use technology in a collaborative or cooperative learning environment. It must be noted the same three participants, two business teachers and one marketing teacher comprised all of the exemplary and acceptable levels for technology integration categories 5 and 6: moving to student-centered learning environment and promoting collaborative and cooperative learning. One business teacher taught in a computer lab and one business and one marketing teacher taught in traditional classrooms.

Table 8

*The Number and Percentage of Time Participants Reached a Level of Technology Integration*

	Implementation Level							
	E		A		I		N/O	
	N	%	N	%	N	%	N	%
1. Teacher planning and organization of the use of technology was clearly evident.	15	20.8	12	16.7	25	34.7	20	27.8
2. Computer activities demonstrated a natural application and a logical connection to the curriculum.	16	22.2	20	27.8	20	27.8	16	22.2
3. The teacher monitored student work at the computer and offered assistance when needed.	18	25.0	14	19.4	7	9.7	33	45.8
4. Technology lesson objectives were clear.	37	51.4	28	38.9	3	4.2	4	5.5
5. There was evidence that the teacher was moving from traditional teacher-directed classroom to an interactive student-centered classroom.	9	12.5	9	12.5	5	6.9	49	68.1
6. The teacher promoted a collaborative, cooperative learning environment.	9	12.5	0	0	0	0	63	87.5

E=Exemplary-observed and judged to be of high quality; A=Acceptable-observed and judged to be of satisfactory quality;

I=Ineffective-observed and judged to be of inadequate quality; N/O=Not observed

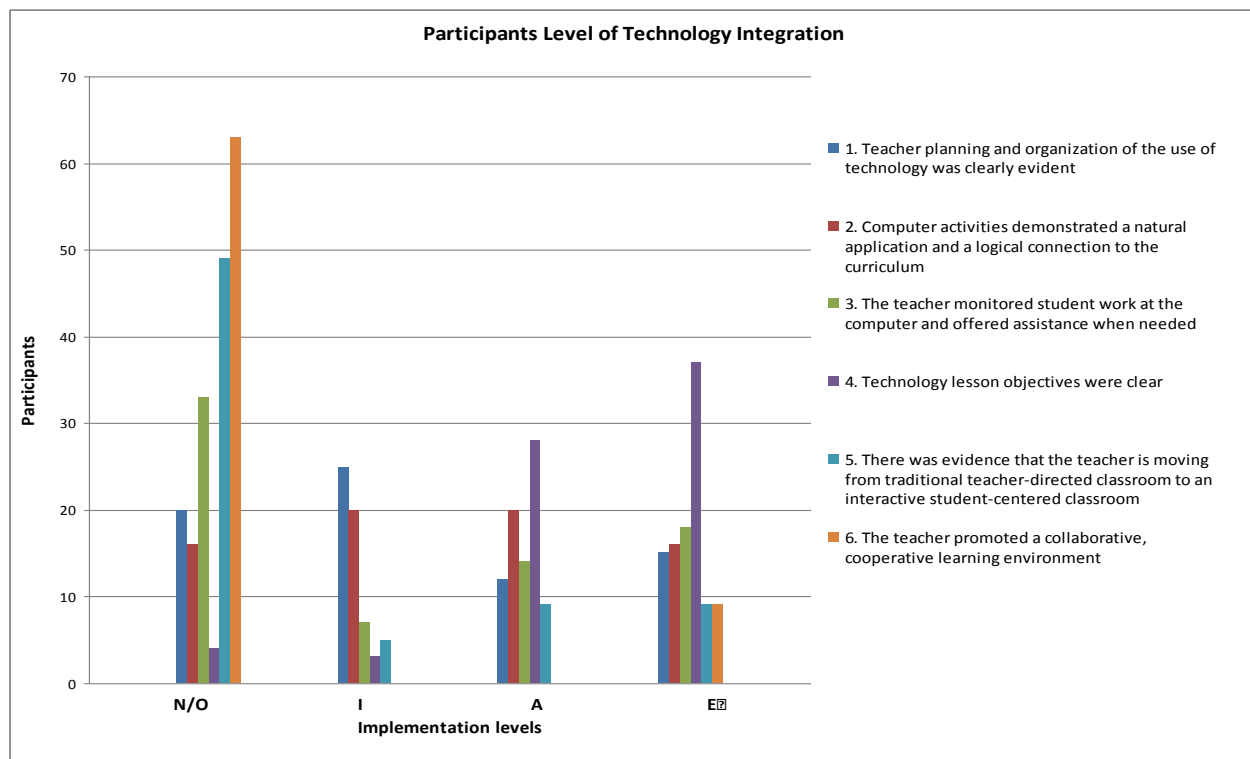


Figure 8. The number of times participants reached a level of technology integration.

To gain further contextual understanding of the participants' technology use and integration the researcher gathered and compiled the observation field note data. Table 9 represents the number and percent of participants who have access to, use, have been trained and use the technology indicated.

Every participant had access to, was trained on, and used Virtual Share and Drop Box accessible on the school division's network server. Eighteen participants have access to School Space but nine have been trained and use the online learning management system. Eighteen participants have access to, trained on, and use *Link*. *Link* is an online program available to parents and students in grades 6-12 that provides easy access to homework assignments, class



grades, attendance and notices. All but one participant has access to an LCD projector beam used to project electronic lessons. Seven of the 18 participants have access to the Promethean® brand of interactive white board while four participants have been trained and only two actually used the Promethean Board®. Although technology tools are widely available in the school district, the lack of training presents an obstacle to participants' technology use and, therefore, to its integration.

Table 9

*The Teachers With Access to, Use, and Trained on a Particular Technology*

Technology	Access		Trained		Used	
	N	%	N	%	N	%
Virtual Share and Drop Box	18	100.0	18	100.0	18	100.0
LCD projector beam	17	94.4	18	100.0	17	94.4
School Space	18	100.0	9	50.0	9	50.0
<i>Link</i>	18	100.0	18	100.0	18	100.0
Promethean Board®	7	38.9	4	22.2	2	11.1
Total Participants	18	100.0				

Table 10 indicates the number of observations made in classrooms with desktop computers and the number and percentage of times desktop computers and laptops were used as an instructional tool as well as the number and times students were off task while using desktop and laptop computers.

Table 10

*Observations in Rooms With Desktop Computers*

	N	%
Desktop computers used for instruction	46	92.0
Laptops used for instruction	4	8.0
Laptops and desktops used for instruction	5	10.0
Students off task while on a computer	16	32.0
Total number of observations in room with desktop computers	50	100.0

Students who take a class in a room with desktop computers also have laptops. The 12 participants teach exclusively in computer labs, one participant teaches in both a computer lab and a classroom without computers. Fifty of the 72 observations were conducted in classrooms with desktop computers. During those 50 observations the researcher noted that desktop computers were used exclusively for instruction 46 times or for 92% of the time. Laptops were used exclusively for instruction four times, or for 8%, of the visits to classrooms with desktop computers. During five observations both laptops and desktops were used during instruction or for 10% of the time. Students were observed off task either while on laptops or on desktop computers during 16 visits, or for 32% of the visits. The researcher considered a student off task if he used his computer (desktop or laptop) to complete a homework assignment, play a game, and watch a video, view products to buy, or check sports scores during instructional time.

Table 11 indicates the number of observations made in classrooms without desktop computers and the number and percentage of times laptops were used as an instructional tool as well as the number and times students were off task while using laptop computers.

Table 11

*Observations in Rooms Without Desktop Computers*

	N	%
Laptops used for instruction	18	81.8
Students off task while on a computer	13	59.1
Observation in room without desktop desktop computers	22	100.0

Observations were conducted in 22 classrooms without desktop computers. Laptops were used for instruction 18 times (81.8%) of these visits. Students were observed off task while on their laptops 13 times (59.1%). during visits, or for 59.1% of the time. Students worked independently and used their laptops to take notes, research assignments, and create PowerPoints. It should be noted that number and percentage of students off task nearly doubled while on a computer in a traditional classroom (59.1%) compared to students off task while on computers in a computer lab (32%).

Table 12 indicates the number and percentage of time a LCD projector beam was used to deliver content to students.

Table 12

*Observations of Use of LCD Projector Beam*

	N	%
LCD projector beam use	27	37.5
Number of observations	72	100.0

During the 72 observations, the LCD beam projector was used to deliver instruction 27 times or for 37.5% of the classroom visits. All participants have been trained to use an LCD projector beam. Seventeen participants (94.4%) have access to LCD projector beams, yet the researcher observed LCD projector beam use 37.5% of the time. The LCD projector beam was primarily used to project bulleted notes in PowerPoint presentations in teacher-centered learning environments.

**Artifact Data**

During 72 observations, copies of teachers' electronic lesson plans from School Space, PowerPoint presentations, student handouts, an Elluminate® session link, a student-created voice thread, a teacher created wiki page lesson, spreadsheets, a video presentation rubric, and one student-created video presentation were collected to provide a detailed contextual understanding of teachers' lived classroom experiences and instructional technology use and integration (Creswell, 2009). Table 13 represents the number and percentage of time technology-based artifacts were collected artifacts as a result of 72 observations.

The researcher electronically collected technology-based artifacts from the 72 observations and added the artifacts to the study's comprehensive FileMaker Pro database,

documenting evidence of participants' instructional technology use and integration. The artifacts collected indicate that during 46 observations or 63.9% of the time, participants' lesson plans included a technology component. The researcher collected a technology-based student handout from 33 observation visits or for 45.8% of the time. Nine PowerPoint presentations were collected during the 72 observations for 12.5% of the time and five spreadsheets were collected for 6.9% of the visits. The researcher collected one artifact each of the following: Elluminate® session link, student created voice thread, teacher-created wiki page, student video, and video presentation rubric. These technology-based artifacts were collected from three of 18 participants or from 16.7% of the participants. The researcher saw no evidence that teachers incorporated online discussion boards, blogs, e-portfolios, global competitions, or virtual field trips.

Although participants had technology available in every classroom, during every class period, technology was utilized for instructional purposes less than two-thirds of the time. Upon detailed examination of the artifacts collected, the researcher noted that participants used new technology in old ways. PowerPoint presentations were used by teachers to project bulleted notes for students, supplanting the old overhead projector technology. Electronic spreadsheets

Table 13

*The Number and Percent of Technology-based Artifacts Collected*

Artifact	N	%
Lesson plans with technology component	46	63.9
Technology-based lesson handouts	33	45.8
PowerPoint slide presentations	9	12.5
Spreadsheets	5	6.9
Elluminate® session link	1	1.4
Student-created voice thread	1	1.4
Teacher-created wiki page	1	1.4
Student-created video	1	1.4
Student video presentation rubric	1	1.4
Online discussion boards	0	0.0
Blogs	0	0.0
Global competitions	0	0.0
Virtual field trips	0	0.0
Student use of interactive white board	0	0.0
Electronic responder use	0	0.0
E-Portfolios	0	0.0
Total number of observations	72	100.0

created by textbook publishers were used by teachers for instruction, supplanting the old accounting journal paper once used. Technology-based handouts required students to search predetermined Internet links for online research, supplanting the old newspaper, magazine, journal, and book research options.

### **Qualitative Strand, Phase 3 Results: Focus Group Analyses**

Two focus group interviews were held after work hours at two county high schools. The first focus group interview was comprised of eight participants: 7 women and 1 man. The second focus group interview was comprised of 10 participants: 9 women and 1 man. The two focus group discussions lasted 70 and 75 minutes, respectively. The researcher was careful to follow a line of inquiry while asking open-ended questions in an unbiased manner (Yin, 2009). The researcher began the focus group interviews by asking the principal guiding question: What effect has a comprehensive, one-to-one laptop initiative had on business and marketing high school teachers' technology skills and technology integration? Two comprehensive questions that were asked included: (a) how has technology (hardware-software) affected the business and marketing classrooms' learning environment, and (b) what technology is used routinely by business and marketing teachers today that was not used a in a classroom eight years ago? Additional questions explored were generated by the lively discussions and answers given during the two sessions.

The subcategories were grouped into broader or core categories which led to two broad themes: instruction and challenges. A variety of technologies, experiences, and challenges are threaded throughout the participants' discussion, each inextricably linked to another:

Theme 1. Instruction centered on content delivery and management, communication, and exemplars.

Theme 2. Challenges centered on professional development, access and use, and technology policies and classroom management.

The qualitative data is represented by two tables, a brief summary, and a narrative. The two tables display the core categories of each theme and one example of the supporting qualitative data collected. Table 14 represents Theme 1-instruction, the number of participants who contributed to the core category discussion and data that supports each category. Table 15 represents Theme 2-challenges, the number of participants who contributed to the core category discussion and participants' quotes that supports each category.

The core categories for Theme 1-instruction are content delivery and management, communication, and exemplars. Table 14 includes the number of participants who made similar statements or agreed with the statement as indicated by the representative supporting data for each category.

The core categories for Theme 2-challenges are professional development, access and use, and technology policies and classroom management. Table 15 includes the number of participants who made similar statements or agreed with the statement as indicated by the representative supporting data for each category.

### **Theme 1. Instruction**

**Content delivery and management.** Content delivery and management are the tangible (hardware) and intangible (software) modes by which information is disseminated and managed. During the first focus group discussion, Eileen explained that content delivery has changed in business labs over eight years to reflect a technology-centered learning environment: "The delivery is here. . .and the one piece of technology that has improved it the most is the LCD projector, that has been wonderful. They can all see it at one time."



Table 14

*Theme 1. Instruction: Core Categories and Supporting Qualitative Data*

12	Content Delivery and Management	" . . .if a student is absent--for makeup I will put [notes] in Virtual Share for a limited amount of time just so they can either take it out or they can have the work made up. . . ." (Sterling).
14	Communication	" . . .we are able to communicate a lot faster with parents because we don't have to take off periods to reach them by phone or even at home on your own time" (Taylor).
3	Exemplars	"In my classroom it [laptop initiative] has made a huge difference. I am much more creative than I was eight years ago. I just try to utilize all the programs--like today--my kids had to create a new cereal product and a commercial, yea--they had to do a commercial in Audacity and [they were] never able to do that before--before eight years ago--they just had to stand up in front of the class--so we brought in sound effects" (Wally).

Table 15

*Theme 2. Challenges: Core Categories and Supporting Qualitative Data*

Participants	Core Categories	Supporting Qualitative Data
10	Professional Development	"Technology is helpful only if we get enough training and practice. . .I feel like if we were all adequately trained we would feel more comfortable in using it. It is a time issue--we've been taught but we don't have enough time to master the technology. If we haven't had a full summer off to develop our skills, we just can't do it" (Tori).
8	Access and use	". . .with the laptop--a lot of students were not bringing them to school because they're too heavy. So I said, 'Well if you bring them to class I'll give you a grade just for participation or for a laptop grade, so I give a few points--and then--they liked that" (Annie).
14	Technology policies and classroom management	". . .I can't show all the bells and whistles, and that is frustrating to me. . .the misbehavior that some of the others have mentioned here and the filters that are in place--that a lot of the things that I'd like to do in the classroom I am unable to do because it's been locked down on the computers for the students. For instance, use

Table 15-continued

Participants	Core Categories	Supporting Qualitative Data
		<p>of a webcam. I wanted to do a little project in which, for instance, the voice threat--where they could respond via web cam and that was not a possibility for them. That's frustrating for me and to the students" (Rita).</p>

Eileen uses the LCD projector in place of an overhead projector. Eileen is using the new technology is an old way but projecting lessons, notes, PowerPoint presentations from her laptop to an interactive whiteboard. The interactive whiteboard is used as a screen rather than for its interactive capabilities.

During the second focus group Wally also talked about changes: “I use it [the computer with LCD projector] to give all my notes, I don’t write on the board at all, all of my notes are in PowerPoint. But then my students use it constantly, ahh, to do projects. I love to use the drawing toolbar in PowerPoint.” Wally uses the LCD projector in the same fashion as Eileen although Wally projects her notes, lessons, and PowerPoints to a pull down screen rather than to an interactive whiteboard.

When asked, seven of the participants indicated that they had access to an interactive whiteboard. The county supports the Promethean® brand of interactive board products. With exception of one participant, all have access to a LCD beam projector that attaches to a computer and pull down screen for viewing. Additional changes include the extensive use of PowerPoint presentations to display notes for students, the use of Virtual Share and Drop Box at school for students’ use and School Space and *Link*, accessible from home for students and parents. The following was Sterling’s response to the use of PowerPoints for content delivery: “I probably use PowerPoints the same way as Wally. All my notes are on PowerPoint and then I put them in School Space, umm, in folders by chapters so the kids can go back and review. And they use PowerPoint for presentations.”

Teachers explained that they displayed their notes in PowerPoint and the students took notes and designed graphic organizers from the PowerPoint presentations. Projecting PowerPoint presentations supplants the use of overhead transparency projectors and plastic transparency

sheets. Teachers utilized the school division's server system to disseminate the notes via the Virtual Share Folder system and online School Space. Teachers create and deploy tests electronically. Jake suggested that he developed testing strategies for students by creating games for them in PowerPoint: "I review for test I create some type of game in a PowerPoint that they are able to study at home and use at home." By providing PowerPoint presentation games to students via School Space, students are able to study anytime and anywhere there is Internet connectivity. This technology is invaluable to students' success.

Tori's comments were about students with individualized education plans (IEPs) and the difference the laptop initiative has made for them: "And what I was going to say, for an individual student. . . some students I have to put it in there for students with IEPs. I have to put it in their personal folder, and they have access to it all the time. I have one that is visually impaired...and so, that is required to have notes in advance and so I drop the PowerPoint in there, he doesn't have to. . . he does pay attention. . .but he doesn't have to worry about writing notes in class."

Students with an individualized education plan (IEP) have accommodations. Examples of an accommodation may be that the student is allowed an untimed testing environment or be provided with class notes. To satisfy the IEP accommodation, teachers provide course materials in teachers' Virtual Share, which is accessible from school, and in School Space that is accessible from home via the Internet.

Rose points out that having the ability to share information electronically has been a positive outcome of the laptop initiative by saying: "...umm I have them do something to engage them while I am going over the notes. I will put. . .if a student is absent. . .for makeup I

will put in Virtual Share for a limited amount of time just so they can either take it out or they can have the work made up, ummm, or individual folders, ahhh, if you know they use them.”

All students now have the ability to access notes and class materials from teachers’ Virtual Share folder. Students can hand in assignments by electronically “dropping” the assignment into a teacher’s Drop Box inside the teacher’s Virtual Share folder. The Drop Box and Virtual Share folder are only accessible at school.

Ellie talked about how the initiative changed the way she delivered and maintained lessons and students’ grades: “Ok, I maintain my lesson plans in School Space, and a student could, ahhh, pull up my calendar for the day that we have my class and see what we’re doing in class that day and. . . and they could do the lesson. If they missed the class or if they didn’t finish the lesson they could refer to it—the School Space calendar—to see, you know, exactly where they were and complete the lesson. Oh ya, eight years ago planning would have been in a plan book, or ahh, or you may have a paper copy or you may have done on a computer but it would have been in your own design. We strictly do planning on. . .I strictly do planning on School Space.”

Teachers are no longer preparing and maintaining lesson plans in traditional lesson plan books; rather, they prepare and maintain lesson electronically, storing them in School Space. School Space online is accessible to students anytime and anywhere there is Internet connectivity.

**Communication.** The one-to-one technology initiative has affected amount and type of communication teachers do now. According to the focus group discussions, the amount and method of communication to and from teachers, students and parents has changed. The participants discussed how the one-to-one laptop initiative has helped disseminate course

content, assignments, messages, and due dates to those students who not at school. Rose said students were now able to access information electronically without having to ask the teacher: “Students. . .there is no reason for them to come up to me because of the way I do things and say ‘What did I miss’ because it’s in their. . .you start where you left off or if you’ve missed something you can fill your folder in. Sometimes I put it in their file because I keep individual files. If they miss something, ummm, to help them to go online. . .not online. . .or online. . .yes, because of. . .if they need to make it up. . .either online or in Virtual Share.”

The teachers’ ability to electronically communicate to students around-the-clock was an important feature of the initiative. Assignments can be posted prior to class and made available to students from home. Teachers have the ability to email parents, students, case workers, and administrators regarding students’ grades, behavior and accomplishments.

Taylor’s comment was: “Along with that, the parents are now able to see what students are doing at least on a weekly basis by checking their grades, which I think has helped with us by not having to make so many phone calls. . . ummm. . . with that correspondence instant almost for them and then through the use of email, we are able to communicate a lot faster with parents because we don’t have to take off periods to reach them by phone or even at home on your own time.”

Technology has made communication between teacher and parent easier and faster. Teachers and parents can email rather than telephone each other. Issues and questions can be address and resolved in a timely fashion making for a more transparent and cooperative working relationship between teacher and parent.

Eileen added: “There are some [students] that are *really* helped by it [technology] tremendously because it does help with the divide when you go home you can still communicate

right through School Space where you live-- but you can't get to Virtual Share from home but you can get to School Space ...

Teachers are able to communicate with students before, during, and after school hours. This extended and open communication time has allowed teachers to communicate important updated information and assignments to students. This is important when students miss school unexpectedly due to illness or inclement weather conditions.

Tori weighed in with *Link* as a mode of communication: "And at the same time we're using *Link*. . . their information will be posted for a month. . .if I know that certain projects or assignments that are due, I will post it ahead of time and they can see when it's actually due and what the actual assignment is, and I do it by class."

*Link* is an online program provided by the school district so parents and students have easy access to homework assignments, class grades, attendance and school/district notices. *Link* adds one more opportunity for open and ongoing communication. The consensus from the groups was that technology has aided the teacher's efforts in communicating assignments and lessons to all students because the content can now be accessed electronically.

**Exemplars.** Some participants stood out as exemplars—teachers who have embraced technology tools for teaching and student learning. Each focus group had at least one outstanding teacher and as the discussion ended the other participants asked detailed questions of each. Sterling and Rita incorporated Elluminate®, voice threads, Google Apps, wiki pages and Jing into their learning environment. Both teachers discussed project-based learning and collaboration. Wally discussed how the initiative has increased teacher and student creativity with Windows MovieMaker, Audacity, and Internet research. Wally stated: "Um. . .In my classroom it has made a *huge* difference, um, much more creative than I was eight years ago. I



just try to utilize all the program. Like today, my kids had to create, um, a new cereal product and a commercial, um, yea, they had to do a commercial in Audacity and, um, never able to do that before. . .before eight years ago. They just had to stand up in front of the class, so we brought in sound effects. And then I have another class that's working on a commercial using Windows Movie Maker, ummm, for the credit union, we have a credit union at our school. Um. . . So I. . .I just noticed that, you know, much more creative hands-on. I [had] kinda gotten away from a book. . . I don't really use a book too much. I just that as a side thing."

Exemplary teachers extend and enhance students' classroom experiences and learning by adding technology to lessons and projects. Exemplary teachers have increased their technology expectations. Exemplars expect to use technology while they teach and they expect students to use technology while they learn.

To illustrate how outstanding teachers' efforts, Rita talked about the possibilities yet to be achieved: "...Yes. . .in my financial literacy class, in fact, I just had, for my final exam, to design an online course, ahh, for students because of this H1N1, and that's really made me think differently about how I deliver all of my lessons in the classroom, as if you're never there, you never have a face to face with your students, everything must be delivered online and, umm, through that I've had them use Google Apps, which is a technology. They've done spreadsheets in that, they've done PowerPoints in that, ahh, I use wiki pages. That's a way for students to collaborate with one another, ahh, it's like a whiteboard out there if you've not used that yet, and you set it up and they can talk to one another on there and plan and do things. I've used Jing, which is like a. . .a program that captures screen shots, ahhh, it's a great tool to have out there on School Space for little videos that you produce for students who've been absent and need to know how to do a certain procedure, for instance."

Exemplars are constantly learning about technology and its possibilities. They seek out applications to incorporate in the learning process. They get excited about technology and pass along the excitement to their students. Exemplars teach in collaborative, student-centered learning environments.

## **Theme 2: Challenges**

Participants discussed various classroom management challenges that have added to teachers' daily work and that have impeded instruction as a result of the technology initiative. Three broad categories of technology challenges discussed focused on professional development, access and use, and technology policies and classroom management.

**Professional development.** Some participants mentioned teachers' technology training and its effect on instruction. Participants discussed that technology training or that practice time has been inadequate or limited. Some participants lamented that they have access to equipment but have not been trained on the equipment. Tori's statement summarized the group's discussion: "Technology is helpful only if we get enough training and practice. We were given access to Elluminate® and the training which we had—the quick training—we had it once during the summer and then again in October. The training we had on staff development day was a lot better. I feel like if we were all adequately trained we would feel more comfortable in using it. It is a time issue. We've been taught but we don't have enough time to master the technology. If we haven't had a full summer off to develop our skills, we just can't do it."

Teachers have access to technology but need and want more training and practice time. Professional development is a challenge for the school district. Teachers must learn about new educational laws and school district policies, new educational trends, and classroom management techniques. They must also learn about new technology hardware, software and online

applications, how to use all the new technology, and then, how to incorporate the new technology into the classroom for instructional purposes.

**Access and use.** A technology issue that was raised was that of students' laptop and Internet access. Participants talked about several challenges; students do not bring their laptops to school, students opt out of having one, some students have court orders that prohibit Internet use, some students do not have Internet access at home. Annie talked about students not using laptops: "I'm just going to say that, umm, with the laptop a lot of students were not bringing them. . .those students who have them. . .were not bringing them to school because they're too heavy. So I said 'Well if you bring them to class I'll give you a grade just for participation or for laptop grade.' So, I give them a little—a few points—and then they like that."

Some students have laptops but do not bring them to school because they are heavy. As an incentive, Annie gives participation points to students who bring and use their laptop. Other participants also gave participation points to students to bring and use their laptops. Laptops are one more item for students to carry around and for which to keep track. Some students are reluctant to be responsible for a heavy laptop added to their list of items carried in their backpack. Thelma stated: "I would just like to say that the laptop initiative, I guess, works for about 80% of the county's population, but the other population. . .we don't have. . .they don't, umm, have laptops. So they don't get to take them home cuz they don't have the resources to have the Internet at their home and so, therefore, there is no need to give a-a-a-a. . .them a laptop and that's why we have a classroom sets, so we don't. . .we're a-a-a-a. . .not in the situation with the 80%, I'm assuming. . .estimate. . . ." The researcher asked for clarification: "So, so. . .I. . . I. . .think now I am confused because I thought part of the initiative was to offer a-a-a. . . folks a-a reduced rate...for the Internet at their home... is that not. . .?" Thelma responded:

“...They don’t have the funding for the reduced rate. The families are not able to. . . so it’s too inconsistent for them to I guess. . .for our population. . .to offer that. I mean, they offer it but nobody takes up on it, maybe two-three students in the school maybe can do that and it’s not worth that. . . .” (Louise was nodding her head. Louise teaches at the same alternative school.)

Eight years into the one-to-one laptop initiative there are still students without Internet access at home. There are still students whose parents or guardians cannot afford Internet access, even with a reduced rate, and those students are at an academic disadvantage. When a student is unable to access the Internet from home he/she is unable to keep pace with classmates since teachers electronically post notes, assignments and grades online in School Space.

Ellie added the following information to the access discussion: “There are certain students who are *not allowed* to have a laptop. There are students that have. . . ahhh. . .have been *court ordered not* to have a laptop. There are students who, ummm, ummm, will get themselves in trouble [giggling] if they have a laptop OK? And so, ahhh, those certain students, you know, some certain classes or schools would be at a disadvantage.” Some students have been through the court system and for their punishment have a court order denying their use of a laptop and/or the Internet. Students with such a court order are academically at a disadvantage since they do not have the same access to class materials and research as other students. Teachers are responsible for preparing alternative lessons for students with court orders.

**Technology policies and classroom management.** Technology policies and their effect on teaching and learning and classroom management challenges were discussed in both focus groups. Participants talked about Internet filtering and about students that were off-task playing games, watching streaming videos, and surfing the web. It was discussed that students have been known to exchange passwords and share documents that reside on the school division’s server.

Students share by moving documents from a computer to a flash drive to another computer.

Because of these challenges participants talked about the need to remotely monitor computer use.

According to some participants, there is now one procedure that teachers must follow to get software loaded onto their teacher laptop and another procedure for software installation on the students' laptops and business lab desktop units. The level of frustration was evident by the emphasis put on words during the discourse. Tori began the discussion about software policies in the first focus group: "Well for us, we have limited software and software that has been purchased is now outdated because of the process that you have to go through to get the software loaded, you as a teacher, and then you have to go through a *different* process to get it pushed for the students so by the time all of that happens the software is outdated or it gets lost in the process. Yes, the software that was purchased now four years ago has *not* been loaded and no one can find any of that and you have to submit the original and it is still out in cyberspace."

The school district's technology policies include a policy on loading software. Because of security, teachers and administrators do not have the ability to load software. Only designated technology department technicians can load software onto desktop and laptop computers. There is a procedure that teachers and administrators must follow to have software approved and loaded onto laptops. The process is not efficient; therefore, according to participants, it may take years before software is actually loaded onto laptops. Unloaded software is unused software. Students do not have the advantage of using unloaded software and teachers cannot enhance learning with the purchased software when it is not loaded.

Rose tagged on to what Tori said by using the word "usability." I asked her what she meant by that word. She answered: "That you can actually. . .that. . .I have a Promethean Board® in my classroom but the software is not on my laptop to be able to use it, so it is not

connecting.” A Promethean Board® is an interactive whiteboard. The Promethean Board® software must be installed on teachers’ laptops in order for the interactive white board to function. If software is not loaded onto a teacher’s laptop, the Promethean Board® becomes nothing more than an expensive projection screen.

Both focus groups brought up the school division’s content filtering topic. In the first focus group, Taylor discussed the computer content filtering as being better than it was during the first year of the one-to-one laptop initiative. “Filters. . .control is better than it was without filters. . .monitoring kids is better. The first year it wasn’t good.” The school district’s technology department is responsible for maintaining the network. In order to maintain the network, a network filtering system must be in place to filter out questionable website content that is inappropriate for an educational environment. The filtering system has evolved as the laptop initiative, technology, and online content has evolved.

However, Wally had concern with the county’s computer filtering system today. Wally was a member of the first focus group. Her comment was: “Filters. . .we think at my school. . . we think the county. . .the filters are too much, students can’t do a lot, they are blocked from a lot of Internet sites.” Although network filters are necessary to keep students safe in an educational setting, the filters can hinder the teaching and learning experience.

In the second focus group, Rita also talked about the county’s content filtering policies. Rita was frustrated by her inability to use many online applications that would bring 21<sup>st</sup> century technology to students. “Well, just max. . .aaah, ahhh. . . just using the. . .the new technology to the highest level. I can still introduce the technology but, you know, it’s at an introductory level, and that is frustrating. You know, I can’t show all the bells and whistles and that’s frustrating to me. I just want to add one frustration is changing your way of teaching with these laptops with

the new technologies is because of the misbehavior that some of the others have, ahh, mentioned here and the filters that are in place, that a lot of the things that I'd *like* to. . .to do in the classroom I am *unable* to do because it's been locked down on the computers for the students. For instance, use of a webcam. I wanted to do a little project in which. . .for instance the voice thread. . .where they could respond via web cam and that was not a possibility for them. That's frustrating for me and to the students." Students' access is blocked from many Internet sites that can have educational value. Free, downloadable, online applications are blocked. A teacher must cite academic reasons when asking written permission from the technology department for student access to blocked Internet content and, even then, access can be denied.

Maggie talked about the struggle to maintain classroom management and the importance of being able to see students' computer screens, and Rita talked about having to remain vigilant. Maggie's concern was the inability to adequately monitor what her students were doing on their computers: "You know, I see a real advantage to that because I find a lot that of students using their laptop as *toys*, as well as a learning device and, I mean, it's their. . .their music, their videos, and it can. . .can become a discipline problem in the classroom, especially when you have a computer lab and they have their desktop open, [heads nodding, several 'um-has'] their laptop open and you. . .that's another *discipline* matter we have to *address*. . .for me, on a *daily* basis in *every* class, keeping those things closed." Rita talked about the need for teachers to remain vigilant: "You just have to be vi-. . .vigilant. You cannot sit in one place. You've got to be on constant move, just as Bridget said, the students know all the tricks, they know how to darken the screen, they know how to put it on a certain angle so you can't see, umm, but you just have to be vigilant. Yes they will use them as toys. Yes, they will try to multitask [she makes quote marks

in the air]. They think they're multitasking, ummm, that *has* been an issue that you've had to address. Be ever vigilant."

Participants expressed frustration with having to constantly monitor laptop use. Laptop monitoring has added an additional level of responsibility to teachers' classroom management duties. Laptops can be a distraction for students. Having high-speed wireless connectivity in every room in every school is a challenge for students and for teachers. K-12 students are not adults. They have to learn restraint and self-control. Students can download games and videos onto their laptops from home and have access to those games and videos during class time. Teachers must be technologically savvy enough to know when students have games, videos, and Internet web pages open, minimized, and ready to view. Taylor talked about important classroom management challenges: ". . .the students can go in their folder but they take it [assignment] out. And if they take it out, they are not *supposed* to be able to share it from one computer to the other; however, if they save it on a flash drive they *can* share it with other students, which is one reason why I don't put it in the Share folder because they all have it and they are not actually paying attention and following along."

Although students have electronic access to notes, assignments, and grades they also have that ability to share their notes, assignments, and grades by transferring the documents to another student's computer using a flash drive. Also, if students can access class notes in the Share folder then they do not pay attention in class, which can cause classroom management problems.

Maggie talked about classroom management with regard to students who use their laptops as toys and what teachers must do to maintain an effective learning environment: "I find a lot that of students using their laptop as *toys* as well as a learning device and, I mean, it's



their. . .their music, their videos, and it can. . .can become a discipline problem in the classroom, especially when you have a computer lab and they have their desktop open, [heads nodding, several ‘um has’) their laptop open and you. . .that’s another *discipline* matter we have to *address*. . .*for me*, on a *daily* basis in *every* class, keeping those things closed.”

Business teachers, who teach in a computer lab with students who have laptops, experience a unique classroom management problem. Specialized software is installed on desktop computers for students to use. Students may enter the classroom with their laptops on. If the lesson requires the use of the desktop computer then the teachers must tell students to keep their laptops shut while working on the desktop computers; otherwise, the teacher runs the risk of students being off-task while both machines are on. Thelma, also in the second focus group, offered a solution to the classroom management issue: “I think to solve sometimes the problem, um, that Maggie was saying about, ahh, observing the class what’s going on, we used to have, umm, software where we could do that. They won’t allow us to have the software where we could be at our desk and observe everybody’s computer and that way we could send them message, we could also shut them down but that has been *removed* now so we can no longer do that now.”

There is a computer software program that is designed for and available to secondary education that allows teachers to monitor computer use and demonstrate lessons from the teacher’s computer. The business computer labs had the computer monitoring software installed, but because the software interfered with the efficiency of the network, it is no longer available to the participants. Monitoring students’ computer use would be easier and would improve classroom management if the participants had access to computer monitoring software.

In summary, eight years of a one-to-one laptop initiative has affected the type and amount of hardware, software, and online resources available to teachers and students. Eight years of the initiative has brought enhanced instructional opportunities and challenges. The initiative has given teachers the opportunity to use technology tools to enhance instruction. Teachers in this study primarily use technology for content delivery and management. Teachers create, store, and deliver content using laptop computers. PowerPoint notes are delivered to interactive whiteboards using LCD projectors. Interactive whiteboards are not being fully utilized either because software is not installed or teachers are not completely trained. Students use technology to electronically take notes, research, and to save and store files. Communication between and among teachers, students, parents, and administration has changed and increased due to the laptop initiative. Because of the increased communication, students and parents are able to access notes, assignments, teachers' calendars, lesson plans, and grades on their issued laptop anywhere at any time. While 15 teachers (83.3%) in this study use new technology in old ways, three teachers stood out as exemplars, using new technology creatively, thus enhancing the learning experiences of their students. Exemplars are teachers who use technology in student-centered learning environments.

The one-to-one initiative has brought challenges to instruction and the learning environment. The three major challenges fell into the categories of professional development, access and use, and technology policies and classroom management. Teachers cited the need for additional and ongoing professional development that will assist the teacher with skills necessary to operate technology efficiently and to effectively integrate the technology into the curriculum. Teachers talked about the students' access and use as a challenge. Students must have their laptop at school, in working order to take advantage of the initiative. Students must also have

Internet connectivity at home to access assignments, notes, grades and lessons. Teachers pointed out that the school district's technology filtering system policies was a double-edged sword. The filtering system does help to deny students' access to inappropriate Internet sites; however, the same filtering system also denies students' and teachers' access to appropriate Internet sites designed to enhance technology use and skills.

## **CHAPTER 5. IMPLICATIONS AND CONCLUSIONS**

Chapter 5 includes implications and conclusions of principal guiding questions as well as subsequent questions, issues, new understandings, conclusions, strengths and limitations, and recommendations for future research are offered.

During the research the investigator was a participant observer. By employing a participant observation method, the researcher was immersed in the study that permitted the “researcher to hear, to see, and to begin to experience reality as the participants do (Marshall & Rossman, 2006). Findings from four sources of evidence were analyzed to address the case study’s principal guiding question: What effect has a comprehensive one-to-one wireless laptop deployment and technology initiative had on business and marketing high school teachers’ technology skills and technology integration over the last eight years? Additional questions explored included: (a) how has technology (hardware, software) in business and marketing classrooms changed over eight years, and (b) how has technology affected the business and marketing classrooms’ learning environment?

The four sources of evidence helped the researcher to establish construct validity and reliability. First, the multiple sources of evidence allowed the researcher to develop “converging lines of inquiry, a process of triangulation and corroboration” (Yin, 2003, p. 115-116). This triangulation addressed potential problems with construct validity since the four sources of evidence provided multiple measures of the same phenomenon. The triangulation of the electronic survey, artifacts, and classroom observations data, helped build evidence of codes and

themes (Creswell & Plano, 2007). Second, a formal presentable database of the case study notes, artifact documents, observation data and digitally narratives evidence collected was created so that other investigators could review the evidence directly and not be limited to the written case study reports (Yin, 2003). The database helped to increase the reliability of the entire case study (Yin, 2003). Third, a chain of evidence was maintained which also helped to increase reliability. The researcher cited specific artifact documents, observations and focus group discussions. A database was maintained to document the circumstances under which the evidence was collected, as the researcher followed the case study protocol (Yin, 2009). Fourth, the researcher employed the member checking for the focus group's qualitative data to help assure validity. The researcher took summaries of the findings to six key participants and asked whether the findings were an accurate reflection of their experiences (Creswell & Plano, 2007).

Quantitative data analyses from participant responses on the online survey, artifacts, and 72 classroom observations were detailed, using descriptive statistics. Qualitative analysis and results of data collected from two focus group sessions were presented in narrative format. The collective results served to provide greater insight regarding analyses of teachers' perceptions and attitudes of a school division's ubiquitous one-to-one laptop initiative. A discussion of the effect on instruction, challenges, new understandings, conclusions, strengths and limitations and recommendations for future research is offered.

Based on the data collected and analyzed, eight years of a comprehensive one-to-one technology initiative has affected business and marketing high school teachers' technology skills as evidenced by the type and amount of technology used for instruction, file management and communication. Hardware, software and online applications have improved giving business and

marketing teachers and students increased opportunity to for research, creativity and interactive learning.

Teachers often mentioned in the focus groups that student reports look more polished and professional when using technology. Microsoft Excel is used to create better graphs, Microsoft Word is used to create better looking reports, and Microsoft PowerPoint is used to create better presentations. However, having access to new technologies does not address teachers' primary concerns about increasing students' abilities to reason, make connections or defend and analyze their results (Drayton, Falk, & Stroud, 2010, p. 42).

Much has changed in the school district during the years of the one-to-one laptop initiative. The original initiative is no longer just about one-to-one computing but rather about technology integration; it has expanded to include the integration of additional classroom-appropriate technologies for teaching and learning. Four years ago, the school division completed the first obsolescence/replacement cycle. High school student laptops changed from a Macintosh to a Windows platform, and this year middle school student laptops followed suit. Eight years of the initiative have brought improved software, hardware, online resources and wireless connectivity. The school district's increased bandwidth has made online connections faster. The Internet's content has expanded exponentially. The increase in online content has allowed students and teachers access to a multitude of relevant and irrelevant resources. At the conclusion of this study, the one-to-one computing is active at eight comprehensive high schools and two technical centers. However, at the alternative high school classrooms have a set of laptops for student use. Ten business and marketing high school classrooms were equipped with Promethean Boards® and one business lab had an Elmo document camera and projection device available for teacher use. Six comprehensive high

schools' administration required the use of School Space, giving students the ability to access course content anytime and anywhere the Internet was available.

Although teachers' instructional content delivery transitioned from old to new technologies, according to data collected from the online survey, observations and focus group discussions, most participants used the new technologies primarily to create, store and deliver instructional content in teacher-centered classrooms. Computer hardware, software and Internet technology have changed the way teachers deliver content but technology has not changed pedagogical methods—in other words, teachers are using innovative technologies while still employing old-fashioned teaching methods. They use interactive whiteboards as screens on which to project PowerPoint presentations. Teachers lecture or demonstrate a skill at the front of the classroom while expecting lock-step student participation. The researcher observed that teachers did not promote a collaborative, cooperative learning environment 87.5% of the time. This study supports research that states, “The teacher often stands in the front of the classroom and uses the SmartBoard to direct attention. PowerPoint slides are often used as visual cues to offer increased organizational tools to students” (Drayton et al., 2010, p. 19).

Word processing is the most common reason for computer use by high school students and teachers (Cuban, 2001). Yet, according to Bebell, Russell, and O'Dwyer (2010), the increased resources provided in one-to-one settings “resulted in an increased frequency and variety of technology use by students and teachers” (p. 7). The studies found that students used their laptops to write papers, browse the Internet, maintain calendars, create presentations, take quizzes, and manage pictures. “Analysis of teacher logs shows variation both within and between schools in teachers' description of how their students used technology in class and for homework” (Drayton et al., 2010, p. 16). Data collected in this study support the research that

the “variation within the schools is not attributable to variations in technology access, but rather to variation in teacher practice” (Drayton et al., 2010, p. 16).

Computer use in schools found the data follows a national trend. After steady and perhaps excessive promotion of technology, computer use in the classroom was uneven and intermittent. Cuban points out that even though access to machines was maximal, change was minimal (Cuban, 2001, p. 93). Data collected indicate that although business and marketing teachers have access to the same software and online resources only three exemplars are found among the 18 participants. Those exemplars were observed transitioning from traditional to interactive classrooms and were observed creating a collaborative learning environment.

Studies indicate that analysis of teacher logs shows variation both within and between schools in teachers’ description of how their students used technology in class and for homework. Variation within the schools is not attributable to variations in technology access, but rather to variation in teacher practice (Drayton et al., 2010, p.16). It is important to note that the standard deviation results of 1.62 from this study’s online survey for the participants’ perceived level of student-centered classroom and from the observed variation in classroom technology use and pedagogies (teacher-versus student-centered classrooms) strongly support the research of Bebell et al. (2010) which states that the variation of technology use was attributed to staff development opportunities and the role of teachers and administrators.. Technology implementation is the teacher’s responsibility. They ultimately decide when and how students use technology.

Instructional content management was simple prior to the one-to-one initiative. During focus group discussions participants confirmed the results of the electronic survey and classroom observations: content management for teachers and students has changed from file cabinets of



folders, paper, teaching materials and grade books to electronic folders and files containing similar information. All participants indicated that they utilize digital organization in some fashion, with 11.1% who encouraged students to create and maintain digital organization systems. Survey results also indicated that seven participants used digital delivery devices to store data and electronic resources to distribute, collect and return data, thus confirming the focus groups' discussions. The results of this study also support research conducted by Suhr, Hernandez, Grimes and Warschauer (2010), who report in their study of upper elementary one-to-one classrooms that the "most common [student] uses of laptops at school were, in order: writing papers, browsing the Internet, creating presentations (KeyNote), maintaining a personal calendar (iCal), managing photos (iCal), working with movies (iMovie), and taking quizzes" (Suhr et al., 2010, p. 22). Similarly, Shapley, Sheehan, Maloney, and Caranikas-Walker (2010) found that "students used laptops in their classrooms most often to conduct Internet research, create presentations, write with a word processor, and to complete a test or quiz" (p. 24).

This research found that teachers used an electronic grading system programmed to reflect their class needs. The grades are electronically exported online to *Link* where, with a username and password, a student and his parents can access the data. School Space, a web-based program, is widely used by teachers to post assignments, lessons, course materials and calendars. School Space is accessible anywhere at any time to students and parents. It is used by suspended, ill, or special-needs students for continuous ready access to necessary documents that once were only distributed by the teacher during the school day. This accessibility has revolutionized content delivery and management for the entire school division's learning community. Teachers widely use the technology available for instruction much more so than student learning.

The focus group discussion brought to light the differences between the type and amount of communication engaged in eight years ago by teachers and the type and amount engaged in now. Eight years ago teachers would communicate to parents via telephone at the end of the day for discipline issues or at the end of the grading period for students' grading issue. Students would have to ask their teacher at school about missing assignments, earned grades and assignment due dates. To communicate today, teachers spend a great deal of time uploading course materials, tests and quizzes, grades and calendars to School Space and *Link* so that information can be accessed at home via the Internet. Teachers frequently and efficiently also communicate to administrators, parents and students via email and by posting information on School Space. The immediacy of the Internet has required teachers' online information to be current; therefore, that a part of their work and personal time is spent communicating.

### **Challenges**

The one-to-one laptop initiative is not without challenges. To begin, the need for adequate technology-based professional development and practice time was discussed. Teachers not only need to learn how to use the technology provided but how to integrate technology into instruction so that technology becomes a teaching and learning tool. Participants expressed that technology training was available but that teachers' practice and collaboration time was limited; therefore, teachers were unable to fully utilize technology tools available for instruction. This finding supports the current research which points to the fact when there are differences in the implementation of technology they were related to the roles of teachers and the administration, and to the professional development opportunities and other available systemic program supports (Bebell et al., 2010).

Given that nearly all of the studies reported that one-to-one programs depend largely on teachers for success, it was not surprising that teacher preparation through professional development was important for successful implementation. Shapley et al. (2010) found that teachers' level of implementation was statistically significantly related to the "quality of professional development ( $r = .47$ )" (p. 33). Related to this point, Drayton et al. (2010) found that a lack of professional development was an obstacle for effective implementation. Their data showed that the teachers in each of the study schools reported that a "lack of time for professional development, especially in the form of teacher collaboration to develop best practices within the school, becomes a barrier to effective integration of computer and Web resources in the classroom" (p. 41).

Another challenge discussed was online access to resources. The study results indicate that the Internet is widely used for research; however, participants discussed their inability to utilize some web-based interactive applications because of the school division's network filtering system. Participants discussed their desire to engage students with dynamic online applications in order to provide students with an interactive 21<sup>st</sup> century real-world learning environment. The network filtering system is necessary to protect students from inappropriate sites or questionable applications and the school division's technology policies are strict which prevents students and teachers access to questionable Internet sites and unproven online resources. School districts with technology initiatives have little choice but to make every effort to protect students from inappropriate Internet sites if they choose to receive educational discounts for technology. "Under the Children's Internet Protection Act (CIPA), no school may receive E-rate<sup>7</sup> discounts unless it certifies that it is enforcing a policy of Internet safety that includes the use of filtering or blocking technology" (Federal Communications Commission, 2010).

Under language enacted in the Telecommunications Act of 1996 (P.L. 104-104), a discount on telecommunications services was implemented for schools and libraries as part of the universal service framework. The Education rate (E-rate) program was established in 1996 to make telecommunications services, Internet access and internal connections available to schools and libraries at discounted rates based upon the income level of the students in their community and whether their location is urban or rural (CRS Report for Congress, 2004).

The last challenge discussed was the shift in classroom management responsibilities. The focus group data indicated classroom management responsibilities have changed since the one-to-one laptop initiative was implemented. Those responsibilities now include monitoring students' technology use. One common technology challenge discussed that required monitoring was the misuse of technology by students. Another technology challenge discussed was how students immediate, ready access to Internet content and jump drives increases the possibility of students becoming distracted and off task. Teachers have expressed their need to check students' screens for inappropriate usage to maintain a productive learning environment. Participants expressed frustration by citing their inability to remotely monitor students' computer screens as another impediment to effectively teaching in a 21<sup>st</sup> century learning environment. Currently, teachers have no ability to remotely monitor student laptop use. To illustrate, when a teacher is at the front of the classroom explaining a lesson or demonstrating skills, students have ample time to rapidly access a web site unrelated to instruction because of the constant available wireless Internet connectivity. It is not until the teacher walks around the classroom that she is aware students may be off task. To manage the learning environment, a monitoring system would be appropriate and useful that would allow a teacher to view and disable student laptop use remotely and quickly from her computer. According to the participants, the additional

responsibility of policing technology use raises teachers' level of daily frustration and lowers their overall technology support (buy-in). Research tells us that "teacher 'buy-in' for technology immersion is critically important because students' school experiences with technology are largely dictated by their teachers" (Shapley et al., 2010, p. 24). Teachers must have the support from administration and the tools necessary to adequately manage the technology use within a classroom setting. According to Drayton, et al. (2010) one of the essential ingredients necessary for a successful technology initiative is the need for school level leadership support for one-to-one initiatives and programs. Teacher acceptance increases with administrative support and administrative support should include being sensitive to the needs of teachers by providing tools necessary for success.

### **Conclusions**

This study examined a school division that has implemented ubiquitous one-to-one computing for eight years, long enough to have passed through one obsolescence/replacement cycle. The research indicated that the one-to-one laptop initiative changed the way teachers deliver and manage instructional content, and communicate with parents, students, and administrators. Ready access to technology software and hardware helped transform how and what was created by teachers and students; however, it is the continued advancement in online applications that has provided students with 21<sup>st</sup> century information, learning opportunities and skills. Teachers have been faced with classroom management and network filtering challenges that impede the teaching and learning and the need for ongoing technology training and practice. There is a need for professional development opportunities so teachers can learn how to seamlessly integrate technology into instruction. Although technology training is available, teachers' practice and collaboration time is limited, therefore, teachers do not fully utilize

technology tools available for instruction. If teachers have access to targeted technology training, and time to practice new skills needed to implement technology in the classroom, then classroom instruction can be enhanced. School administrators must provide adequate professional opportunities and practice for teachers to use and integrate 21<sup>st</sup> century technology tools for classroom instruction.

Most teacher-participants utilized the technology for instruction, not student learning. Teachers use new technologies with old ways. When new technologies were adapted, old practices were sustained (Cuban, 2001). Teachers must continue to hone their technology skills, knowledge, and methodologies in order to change from being the “sage-on-the-stage” to “guide-on-the-side.” Teachers must teach students using 21<sup>st</sup> century technologies in student-centered learning environments.

### **New Understandings**

New understandings emerged based on the perceptions voiced by the 18 participants. Not all students can have access to technology. Based on court orders, for example, there are students that are not allowed to have access to Internet technology. “There are certain students who are *not allowed* to have a laptop. There are students that have. . .have been court *ordered not* to have a laptop. There are students who. . .will get themselves in trouble” (Ellie, participant). According to the participants, not all students have Internet access at home and do not have access to online lessons, assignments and calendars, therefore, teachers must make alternative arrangements for those students. Participants said that not all parents want their student to have a laptop computer; therefore, teachers must make alternative arrangements for those without computers.

## **Strengths and Limitations**

There are strengths as well as limitations to this study that analyzed business and marketing teachers' use of instructional technology integration.

### **Strengths**

One hundred percent of the possible sample participated in the study. The sample consisted of all business and marketing high school teachers who had been continuously employed during the entire one-to-one laptop initiative. A case study database of evidence and a chain of evidence were maintained to increase reliability. Validity was determined using three methods: triangulation of data, member checking, and external auditors. Artifacts were collected during each observation as evidence of participants' lessons, and classroom observations covered events in real time giving a contextual feel while lending insight and a broader perspective of technology use and integration over two months instruction. The participants' willingness to discuss their perspective of a ubiquitous technology initiative frankly and without reservation may be considered strength. The researcher attempted to understand the motives and meanings of the participants' discussion.

### **Limitations**

Inherent in any study are weaknesses related to the design and methods of data collection and analysis, which are identified as limitations (Creswell, 2003). This research study was conducted by a participant observer whose professional relationship with the participants is that of central office administrator. The researcher may have less "ability to work as an external observer and may, at times have to assume positions or advocacy roles contrary to the interests of the good social science practice" (Yin, 2003). Although the researcher was a participant

observer and the observations were unannounced, the participants may have behaved differently because of being observed. The researcher took great care in assuring teachers that her role of participant observer was wholly separate from her role as central office administrator. This study is not generalizable in the usual quantitative sense; however, concepts discussed by the participants may have transferability to certain other settings (Lincoln & Guba, 1985). The study was limited to one school division and was limited to business and marketing teachers, a subset of career and technical education. The rather homogeneous nature and the small number of the participants may also be considered limitations. The questionnaire used in the study was a self-assessment that each teacher completed about his/her attitudes toward computers. The artifacts collected were from classroom observations and were only a small representation of lessons taught.

### **Recommendations for Future Research**

As findings and their meanings emerged, thoughts for continuing this study surfaced. Given the strengths and limitations developed from the findings the following are recommendations for further research. The research should explore questions that root out the core reasons to have and maintain a one-to-one laptop initiative namely, does the initiative bring about pedagogical change, does it make profound learning attainable, and does it provide differentiated learning experiences that produce measurable and substantial academic and social effects (Weston & Bain, 2010)? Research should examine the amount and type of technology training available, and the amount of practice time necessary to effectively integrate instructional technology and change pedagogy. Additionally, research should explore questions that root out how postsecondary institutes prepare teachers; namely, how does the institute teach 21<sup>st</sup> century



skills, does it model student-centered learning, and does it teach how to effectively design technology-based lessons plans?

### **Summary**

The school division's one-to-one laptop initiative began in 2001 with the deployment of laptops to every high school student. By June 2010, every high school and middle school student was offered a laptop and every elementary school classroom had a set of laptops. Wireless connectivity was available at every school and interactive white boards were an integral part of many classrooms.

The effect that a comprehensive, one-to-one laptop initiative had on business and marketing high school teachers' technology skills and technology integration was twofold. First, instruction was affected. Teachers and students now use computers to create documents, research information, and manage data. Teachers, students and parents use computers for reciprocal communication. Second, challenges emerged. Teachers' classroom management responsibilities changed to include laptop monitoring, and network filtering policies created Internet access issues. Teachers also voiced a need for additional technology-based professional development and time to practice new skills.

And finally, while some positive effects were visible, eight years into the one-to-one laptop initiative issues were evident. Administrative support as well as teacher acceptance seemed to play an important role in teachers' willingness to regularly and enthusiastically modify their pedagogy to include the integration of technology.

## List of References

- Adobe<sup>®</sup> Systems Incorporated. *PDF reference, version 1.23* (6<sup>th</sup> ed.). San Jose, CA: Author.
- Ashton, J., & Newman, L. (2006). An unfinished symphony: 21<sup>st</sup> century teacher education using knowledge creating heutagogies. *British Journal of Educational Technology*, 37(6), 825.
- Association for Better Living and Education International (ABLE). (2008). *One-to-one computing in public schools: Lessons from 'laptops for all' programs* (pp.4-9). Retrieved from [http://www.able.org/pubsitems/ed\\_onetoone\\_98.pdf](http://www.able.org/pubsitems/ed_onetoone_98.pdf).
- Association of Career and Technical Education. (2004, September). *Techniques*. National Task Force on Preparing Youth. Retrieved from <http://www.acteonline.org/content.aspx?id=5786&terms=National+Task+Force+on+Preparing+Youth>.
- Association of Career and Technical Education. (2006, July 27). *Statement of ACTE on the U.S. senate approval of 'Carl D. Perkins career and technical improvement act of 2006.'* Retrieved on May 20, 2008, from <http://www.acteonline.org/content.aspx?id=2142&terms=2006+Perkins>.
- Association of Career and Technical Education. (2008). Available on April 14, 2008, from [http://www.acteonline.org/uploadedFiles/About ACTE/files/Times-are-A-Changing.pdf](http://www.acteonline.org/uploadedFiles/About%20ACTE/files/Times-are-A-Changing.pdf), p. 38.

- Barron, A. E., & Orwig, G. W. (1993). *New technologies for educators: A beginner's guide*. Englewood, CO: Libraries Unlimited.
- Bebell, D., Russell, M., & Dwyer, L. (2004). Measuring teachers' technology uses: Why multiple-measures are more revealing. *Journal of Research on Technology in Education*, 37(1), 45.
- Bebell, D., Russell, M., & Dwyer, L. (2010). Educational outcomes and research from 1:1 computing settings. *Journal of Technology, Learning, and Assessment*, 9(1).
- Bialo, E. R., & Sivin-Kachala, J. (1996, Fall). The effectiveness of technology in schools: A summary of recent research [Electronic version]. *School Library Media Quarterly*, 25(1). Retrieved from <http://www.ala.org/ala/mgrps/divs/aasl/aaslpubsandjournals/slmrb/editorschoiceb/infopower/slctbialohtml.cfm>.
- Bickner, R. (2001, April 6). *Down by law*. Retrieved from <http://www.alistapart.com/articles/downbylaw>.
- Bielefeldt, T. (2006, July). *Teaching, learning, and one-to-one computing*. Paper presented at the International Society for Technology in Education, National Education Computing Conference, San Diego, CA.
- Blood, R. (2000). *Weblogs: A history and perspective*. Retrieved on September 7, 2000, from [http://www.rebeccablood.net/essays/weblog\\_history.html](http://www.rebeccablood.net/essays/weblog_history.html).
- Bonifaz, A., & Zucker, A. (2004). *Lessons learned about providing laptops for all students*. (Eric Document Reproduction Service No. ED485606). Newton, MA: Education Development Center.

- Brazell, A. (2009, April). *It's a read/write/execute web and we just live in it*. Retrieved from Technosailor.com. at <http://technosailor.aaronbrazell.com/2009/04/22/its-a-readwriteexecute-web-and-we-just-live-in-it/>.
- Bulletin Solutions Inc. (2010). *Discussion board*. Retrieved from [http://www.vbulletin.com/forum/faq.php?faq=vb3\\_board\\_usage#faq\\_vb3\\_forums\\_threads\\_posts](http://www.vbulletin.com/forum/faq.php?faq=vb3_board_usage#faq_vb3_forums_threads_posts).
- Byrom, E., & Bingham, M. (2004). *Factors influencing the effective use of technology for teaching and learning. Lessons learned from the SEIR-TEC intensive site schools* (2<sup>nd</sup> ed.). Greensboro, NC: SERVE. (ERIC Document Reproduction Service No. ED471140).
- Chao, E. L. (2006, August 16). *Economic security demands skilled workforce*. Presentation at the 13<sup>th</sup> National Labor-Management Conference, Chicago, IL. Retrieved on October 19, 2010, from <http://www.hr-topics.com/wire-usa/skilled-workforce.htm>.
- Cheese, R. (2008, March 3). Netting the net generation: Generation Y, the millenials—no matter what you call them you'll need to know how to recruit and retain today's top young performers. *Bloomberg Businessweek*. Retrieved from [http://www.businessweek.com/managing/content/mar2008/ca20080313\\_241443.htm?campaign\\_id=rss\\_null](http://www.businessweek.com/managing/content/mar2008/ca20080313_241443.htm?campaign_id=rss_null)
- Code of Virginia § 22.1-253.13:1B.
- Council on Education for Public Health. (2006). Available on July 22, 2010, from [http://www.ceph.org/pdf/Competencies TA.pdf](http://www.ceph.org/pdf/Competencies%20TA.pdf).
- Creswell, J. W. (2009). *Research design qualitative, quantitative, and mixed methods approaches* (3<sup>rd</sup> ed.). Lincoln, NE: University of Nebraska, Sage Publications Inc.
- Creswell, J. W., & Plano, V.L., (2007). Qualitative research designs: Selection and implementation. *The Counseling Psychologist*, 35(2), 236.

- Creswell, J. W., & Tashakkori, A. (Eds.). (2007). *Journal of methods research* (pp. 93-108). Newbury Park, CA: Sage.
- CRS Report for Congress (2004). Retrieved from <http://www.fas.oreg/irp/crs/IRL32567.pdf>.
- Cuban, L., (2001). *Oversold and underused: Computers in the classroom*. Cambridge, MA: Harvard University Press.
- Dare, D. E. (2006, Fall). The role of career and technical education in facilitating student transitions to postsecondary education [Published online by Wiley InterScience]. *New Directions for Community Colleges*, 135. doi: 10.1002/cc.249. Retrieved on February 2, 2009, from [http://www.acteonline.org/uploadedFiles/About\\_CTE/files/roleofCTE-2.pdf](http://www.acteonline.org/uploadedFiles/About_CTE/files/roleofCTE-2.pdf).
- Davis, M. R. (2007). *Interactive features demand for modern chalkboards*. Whiteboard, Inc. Retrieved on September 12, 2007, from [http://www.edweek.org/dd/articles/2007/09/12/02\\_board.h01.html](http://www.edweek.org/dd/articles/2007/09/12/02_board.h01.html).
- Dede, C. (2004). Enabling distributed learning communities via emerging technologies. Part 1. *Technical Horizons in Education Journal*, 32(2), 12.
- Denzin, N. K., & Lincoln, Y. S. (Eds.). (1994). *Handbook of qualitative research*. Thousand Oaks, CA: Sage.
- Doolittle, P., & Camp, W. (1999). Constructivism: The career and technical education perspective. *Journal of Vocational and Technical Education*, 16(1), 23.
- Drayton, B., Falk, J. K., & Stroud, R. (2010, January). After installation: Ubiquitous computing and high school science in three experienced, high-technology schools. (ERIC Document Reproduction Service No. EJ873677). *Journal of Technology, Learning, and Assessment*, 9(3).

- Education Commission of the States. (2006, January). States, districts beginning to tap the potential of technology-enhanced learning. *The Progress of Education Reform 2006. Technology in Education Report*, 6(6). Retrieved from <http://www.ecs.org/clearinghouse/67/10/6710.pdf>.
- Educational Testing Service. (2001). *Digital transformation: A framework for ICT literacy*. Retrieved from [http://www.ets.org/Media/Tests/Information\\_and\\_Communication\\_Technology\\_Literacy/ictreport.pdf](http://www.ets.org/Media/Tests/Information_and_Communication_Technology_Literacy/ictreport.pdf).
- Evaluation of the Texas Technology Immersion Pilot, Final outcomes of a four-year study (2004-05 to 2007-08). (2009). *Texas Center for Educational Research*, iii-ix.
- Edwards, M. A. (2001) A laptop for every learner. *Scholastic Administrator*. Retrieved from <http://www2.scholastic.com>.
- Federal Communications Commission. (2010). *Children's internet protection act*. Retrieved on October 19, 2010, from <http://www.fcc.gov/cgb/consumerfacts/cipa.html>.
- Forcese, D., & Richer, S. (1973). *Social research methods*. Englewood, NJ: Prentice-Hall.
- Freeman, L. (1996). Vo-tech goes hi-tech. *School Planning Management*, 35(3), 30.
- Garthwait, A., & Weller, H. (2005). A year in the life: Two seventh grade teachers implement one-to-one computing. *Journal of Research on Technology in Education*, 37(4), 361.
- Gehring, J. (2000, June 21). Career-prep high schools let students get their feet wet. *Education Week*. Retrieved on October 19, 2010, from <http://www.edweek.org/ew/articles/2000/06/21/41new.h19.html?4=315184772>.
- Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago, IL: Aldine.

Gordon, H. R. D. (2008). *The history and growth of career and technical education in America*.

Long Grove, IL: Waveland Press, Inc.

Hamel, J. (Ed.) (1992). The case study method in sociology. *Current Sociology*, 40.

Hartley, J. (2007). Teaching, learning and new technology: A review for teachers. *British Journal of Educational Technology*, 38(1), 42-62.

Haynes, C. (1996). *The effectiveness of using laptop computers with middle school students identified as being inhibited writers*. Unpublished doctoral dissertation (UMI Publication Number 9630228) Union Institute, Cincinnati, OH. .

Heinecke, W. P. (2008). *Laptop use in algebra I classrooms in Henrico county public schools, final report*. Charlottesville: University of Virginia, Center for Technology & Teacher Education.

Henrico County Public Schools (2008a). Available on February 9, 2009, from <http://www.apple.com/nz/education/profiles/henrico1>.

Henrico County Public Schools (2008b). Retrieved from [http://images.apple.com/ca/education/profiles/henrico1/pdf/henrico1\\_100303.pdf](http://images.apple.com/ca/education/profiles/henrico1/pdf/henrico1_100303.pdf).

International Society for Technology in Education (ISTE). (2000). *NETS for teachers 2000*. Retrieved on August 28, 2010, from [http://www.iste.org/Content/NavigationMenu/NETS/ForTeachers/2000Standards/NETS\\_for\\_Teachers\\_2000.htm](http://www.iste.org/Content/NavigationMenu/NETS/ForTeachers/2000Standards/NETS_for_Teachers_2000.htm).

Intel. (2006). *Five years, 30,000 laptops*. White paper. Retrieved on April 21, 2008, from [http://www.k12blueprint.com/k12/blueprint/cd/8380 IN Henrico Final.pdf](http://www.k12blueprint.com/k12/blueprint/cd/8380%20IN%20Henrico%20Final.pdf).

- Jones, G., Rubenson, K., & Fisher, D., (2009, May). The political economy of post-secondary education: A comparison of British Columbia, Ontario and Quebec. Higher Education. (ERIC Document Reproduction Service No. EJ835349). *The International Journal of Higher Education and Educational Planning*, 57(5), 549-566.
- J. Sargeant Reynolds Community College. (2008). Retrieved on May 12, 2008, from <http://www.reynolds.edu/techprep/Default.htm>.
- Keen, A. (2008, April). *Web 1.0 + Web 2.0 = Web 3.0. Andrew Keen on media, culture, and politics: The future with a twist*. Retrieved from [http://www.andrewkeen.typepad.com/the\\_great\\_seduction/2008/04/web-10-web-20-w.html](http://www.andrewkeen.typepad.com/the_great_seduction/2008/04/web-10-web-20-w.html).
- Keengwe, J. (2008). The use of computer tools to support meaningful learning. *Association for the Advancement of Computing in Education Journal*, 16(1), 77.
- Kember, D. (1997). A reconceptualisation of the research into university academics conceptions of teaching. *Learning and Instruction* 7(3), 255-275.
- Klassen, R. D., & Jacobs, J. (2001). Experimental comparison of web, electronic and mail survey technologies in operations management. *Journal of Operations Management*, 19, 713-728.
- Knezek, G. A., & Christensen, R.W. (2009, Summer). Construct validity for the teachers' attitudes toward computers questionnaire. (ERIC Document Reproduction Service No. EJ844212). *Journal of Computing in Teacher Education*, 25(4), 143-155.
- K12 Blueprint Computing. (2006). *Results. eNewsletter*. Available from <http://www.k12blueprint.com/k12/blueprint/results.php>.
- Leh, A. S. C., Kouba, B., & Davis, D. (2005). Twenty-first century learning: Communities, interaction and ubiquitous computing. *Educational Media International*, 42(3), 237-250.



- Lei, J., & Zhao, Y. (2008). One-to-one computing: What does it bring to schools? *Journal of Educational Computing Research*, 39(2), 97.
- Liming, D., & Wolf, D. (2008). *Job outlook by education 2006-2016*. Retrieved on May 20, 2008, from <http://www.bls.gov/opub/ooq/2008/fall/art01.pdf>.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage Publications, Inc.
- Mann, D. (2009). *Documenting outcomes from Henrico county public schools' laptop computing initiative: 2005-06 through 2007-08, Technical Report, Phase II 2007 data*. Interactive, Inc.
- Marshall, C., & Rossman, G. B. (2006). *Designing qualitative research*. Sage.
- Maxwell, J. A. (1996). *Qualitative research design: An interactive approach*. Thousand Oaks, CA: Sage.
- McAfee, A. (2006). Enterprise 2.0: The dawn of emergent collaboration. *Massachusetts Institute of Technology Sloan Management Review*, 47(3), 21–28.
- McMillian, J. H. (2004). *Educational research fundamentals for the consumer* (4<sup>th</sup> ed.). Boston: Pearson.
- Meeder, H. (2006). *The Perkins act of 2006: Connecting career and technical education with the college and career readiness agenda*. Achieve Policy Brief. Achieve, Inc. 2008, (ED 499901) (p. i-vi).
- Merriam, S. B. (1998). *Qualitative research and case study applications in education*. San Francisco: Jossey-Bass.
- Metiri Group (2001). *What's so different about the 21st century?* Retrieved from <http://www.metiri.com/features.html>.

- Miles, M., & Huberman, M. (1994). *Qualitative data analysis* (2<sup>nd</sup> ed.). Thousand Oaks, CA: Sage.
- Mitchell, S. (2008, July). Easy wiki hosting, Scott Hanselman's blog, and snagging screens [Electronic version]. *MSDN Magazine*. Retrieved from <http://msdn.microsoft.com/en-us/magazine/cc700339.aspx>
- Morse, J. M. (1994). Designing funded qualitative research. In N. K. Denzin, & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 220-235). Thousand Oaks, CA: Sage.
- Moursand, D. (1997). The growth of instructional technology. *Learning and Leading with Technology*, 25(2), 4-5.
- Muir-Herzig, R. G. (2004). Technology and its impact in the classroom. *Computers and Education*, 42(2), 111-131.
- Noeth, R. J., & Volkov, B. B. (2004). *Evaluating the effectiveness of technology in our schools*. ACT Policy Report. Retrieved from [http://www.act.org/research/policymakers/pdf/school\\_tech.pdf](http://www.act.org/research/policymakers/pdf/school_tech.pdf), p. 9.
- O'Hanlon, C. (2007, February). 1-to-1 computing: A measure of success [Electronic version]. *Technological Horizons in Education Journal*. Retrieved on June 3, 2008, from <http://thejournal.com/Articles/2007/02/01/1to1-Computing--A-Measure-of-Success.aspx>.
- Partnership for 21st Century Skills. *Framework for 21st century learning*. Retrieved on February 12, 2009, from <http://www.21stcenturyskills.org/>.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2<sup>nd</sup> ed.). Newbury Park, CA: Sage.

- Penuel, W. R. (2006). Implementation and effects of one-to-one computing initiatives: A research synthesis. *Journal of Research on Technology in Education*, 38(3), 329-348.
- Perry, N. (1989, June 19). The new, improved vocational school [Electronic version]. *Fortune*, 119(13), 72-131. Retrieved from [http://money.cnn.com/magazines/fortune/fortune\\_archive/1989/06/19/72131/index.htm](http://money.cnn.com/magazines/fortune/fortune_archive/1989/06/19/72131/index.htm).
- Rockman, S. (2004). Positioning evaluation and research within PT3 projects. *Journal of Technology and Teacher Education*, 12(2), 155.
- Roschelle, J., Penuel, W., & Abrahamson, L. (2004). The networked classroom. *Educational Leadership*, 61(5), 50.
- Schachter, R. (2009, November/December). Mobile devices in the classroom. *District Administration*, 30-36.
- Scott, J. L., & Sarkees-Wircenski, M. (1996). *Overview of vocational and applied technology education*. Homewood, IL: American Technical Publishers.
- Shapley, K. S., Sheehan, D., Maloney, C., & Caranikas-Walker, F. (2010, January). Evaluating the implementation fidelity of technology immersion and its relationship with student achievement. [Electronic version]. *The Journal of Technology Learning and Assessment*, 9(4), 24. Retrieved from <http://escholarship.bc.edu/cgi/viewcontent.cgi?article=1204&context=jtla>.
- Silverman, D. (2000). Analyzing talk and text. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (2<sup>nd</sup> ed.) (pp. 821-834). Thousand Oaks, CA: Sage.
- Silverman, D. (2000). *Doing qualitative research: A practical handbook*. Thousand Oaks, CA: Sage.

- Southern Regional Education Board. (2008). *High schools that work*. Retrieved on May 20, 2008, from [http://www.sreb.org/page/1137/about high schools that work.html](http://www.sreb.org/page/1137/about_high_schools_that_work.html).
- Stake, R. E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage.
- Strauss, A. L., & Corbin, J. (1998). *Basics of qualitative research* (2<sup>nd</sup> ed.). *Grounded theory procedures and techniques*. Newbury Park, CA: Sage.
- Stevenson, I. (2008). Tool, tutor, environment or resource: Exploring metaphors of digital technology and pedagogy using activity theory. *Computers Education*, 51(2), 836.
- Stevenson, O. (2008). Ubiquitous presence, partial use: The everyday interaction of children and their families with ICT. *Technology Pedagogy and Education*, 17(2), 115.
- Suhr, K. A., Hernandez, D. A., Grimes D., & Warschauer (2010, January). Laptops and fourth-grade literacy: Assisting the jump over the fourth-grade slump. (ERIC Document Reproduction Service No. EJ873679). *Journal of Technology, Learning, and Assessment*, 9(5).
- Swail, W. S., & Kampits, E. (2004). *Work-based learning and higher education: A research perspective*. Washington, DC: Educational Policy Institute, Inc.
- Swan, K. (2007). Ubiquitous computing and changing pedagogical possibilities: Representations, conceptualizations and uses of knowledge. *Journal of Educational Computing Research*, 36(4), 481.
- Swan, K., Kratcoski, A., Mazzer, P., & Schenker, J. (2005). Bringing Mohamed to the mountain: Situated professional development in a ubiquitous computing classroom. *Journal of Educational Computing Research*, 32(4), 262, 353-365.
- Times Are A Changing. (2002, February). *Techniques*. Retrieved from [http://www.acteonline.org/uploadedFiles/About ACTE/files/Times-are-A Changing.pdf](http://www.acteonline.org/uploadedFiles/About_ACTE/files/Times-are-A_Changing.pdf).

- Tutor2u. (2010). *Introduction—What is ICT?* Retrieved on October 19, 2010, from [http://tutor2u.net/business/ict/intro what is ict.htm](http://tutor2u.net/business/ict/intro%20what%20is%20ict.htm).
- U.S. Census Bureau. (2000). *Henrico County, Virginia*. Retrieved on September 15, 2008, from [http://factfinder.census.gov/servlet/QTTable?\\_bm=n&\\_lang=en&qr\\_name=DEC2000\\_SF1\\_U+DP1&ds+name=DEC\\_2000\\_SF1\\_U&geo\\_id=05000US51087](http://factfinder.census.gov/servlet/QTTable?_bm=n&_lang=en&qr_name=DEC2000_SF1_U+DP1&ds+name=DEC_2000_SF1_U&geo_id=05000US51087).
- U. S. Department of Education. (2010). *Vocational education: Carl D. Perkins career and technical education act of 2006. Reauthorization of Perkins*. Retrieved on July 22, 2010, from <http://www2.ed.gov/policy/sectech/leg/perkins/index.html>.
- U.S. Department of Labor. (2006). America is transitioning to a knowledge-based economy, creating millions of new jobs in industries that did not exist a generation ago and which demand highly educated and skilled workers. Office of Public Affairs news release, (06-1452-CHI). Retrieved from <http://www.bls.gov/>.
- U.S. Department of Labor. (2008). *Training, other qualifications, and advancement*. Retrieved from <http://WWW.bls.gov/oco/ocos007.htm#training>.
- Viadero, D. (2000, June 21). Riley announces national commission on high school. *Education Week*. Retrieved on October 19, 2010, from <http://www.edweek.org/ew/articles/2000/06/21/41new.h19.html?4=315184772>.
- Virginia Career and Technical Education Resource Center. (2010a). Available on July 22, 2010, from [http://www.cteresource.org/verso2/framework/course\\_description/business\\_and\\_information+technology/advanced\\_computer\\_information\\_systems\\_661336wks\\_661518wks/2010/6613](http://www.cteresource.org/verso2/framework/course_description/business_and_information+technology/advanced_computer_information_systems_661336wks_661518wks/2010/6613).

Virginia Career and Technical Education Resource Center. (2010b). Available on August 22, 2010, from

[http://www.cteresource.org/verso2/framework/course\\_description/business\\_and\\_information\\_technology/design\\_multimedia\\_and\\_web\\_technologies\\_663036wks\\_663218wks/20010/6630](http://www.cteresource.org/verso2/framework/course_description/business_and_information_technology/design_multimedia_and_web_technologies_663036wks_663218wks/20010/6630).

Virginia Career and Technical Education Resource Center. (2010c). Available from

[http://www.cteresource.org/verso2/framework/course\\_description/business\\_and\\_information\\_technology/programming\\_664036wks/2010/6640](http://www.cteresource.org/verso2/framework/course_description/business_and_information_technology/programming_664036wks/2010/6640).

Virginia Department of Education. (2007). *An analysis of the instructional technology resource teacher (ITRT) program in Virginia*. Information Brief. Division of Technology and Human Resources, Office of Educational Technology. Retrieved from

[http://www.doe.virginia.gov/support/technology/info\\_briefs/analysis\\_teacher\\_prog.pdf](http://www.doe.virginia.gov/support/technology/info_briefs/analysis_teacher_prog.pdf).

Virginia Department of Education. (2008). Retrieved from

[http://www.doc.virginia.gov/instruction/career\\_technical/path\\_industry\\_certification/cte\\_credentials/factsheets/high\\_stakes\\_credentialing.pdf](http://www.doc.virginia.gov/instruction/career_technical/path_industry_certification/cte_credentials/factsheets/high_stakes_credentialing.pdf).

Virginia Department of Education (2009). Retrieved from

[http://www.doe.virginia.gov/instruction/career\\_technical/statistics\\_reports/annual\\_performance/2007-2008.pdf](http://www.doe.virginia.gov/instruction/career_technical/statistics_reports/annual_performance/2007-2008.pdf).

Virginia Department of Education. (2010). *Testing and standards of learning (SOL): The standards and SOL-based instructional resources*. Retrieved on July 22, 2010, from

[http://www.doc/Virginia.gov/testing/sol/standards\\_docs/index.shtml](http://www.doc/Virginia.gov/testing/sol/standards_docs/index.shtml).

Webquest. (2007). *What is a webquest?* Retrieved from <http://www.webquest.org>.

- Wells, J. E. (1999). When art imitates voc ed. (benefits of vocational education). *Techniques*, 1(1), 32-33.
- Weston, M. E., & Bain, A. (2010). The end of techno-critiques: The naked truth about 1:1 laptop initiatives and educational change. *The Journal of Technology, Learning, and Assessment*, 9(1).
- Willis, E. M., & Raines, P. (2001, September). Technology in secondary teacher education: Integration, implications and ethics for the changing roles of teachers. (ERIC Document Reproduction Service No. EJ637518). *Technological Horizons in Education Journal*, 29(2) 54-64.
- Wikipedia Organization. (2010a). Retrieved July 22, 2010, from [http://en.wikipedia.org/wiki/Minority-majority\\_state](http://en.wikipedia.org/wiki/Minority-majority_state).
- Wikipedia Organization. (2010b). *Blackboard, Inc.* Retrieved on July 22, 2010, from [http://en.wikipedia.org/wiki/Blackboard Inc.](http://en.wikipedia.org/wiki/Blackboard_Inc)
- Wolff, S. J., & Copa, G. H. (2003, February). *New designs for career and technical education at the secondary and postsecondary levels: Compendium of design reviews of related research, policies, and exemplary practices*. (ERIC ED480313). New Designs for Learning, Oregon State University, Corvallis. Retrieved from <http://www.eric.ed.gov/PDEFS/ED480313.pdf>.
- Wolfram, C. (2010, March). *Conrad Wolfram on communicating with apps in web 3.0. IT PRO*. [file://localhost/Retrieved from http://www.itpro.co.uk:621535:q-a-conrad-wolfram-on-communicating-with-apps-in-web-3-0](http://localhost/Retrieved%20from%20http://www.itpro.co.uk:621535:q-a-conrad-wolfram-on-communicating-with-apps-in-web-3-0)
- Yin, R K. (2003). *Case study research design and methods* (3<sup>rd</sup> ed.). Thousand Oaks, CA: Sage.
- Yin, R. K. (2009). *Case study research design and methods* (4<sup>th</sup> ed.). Thousand Oaks, CA: Sage.

- Zucker, A. (2004). Developing a research agenda for ubiquitous computing in schools. *Journal of Educational Computing Research*, 30(4), 371-386.
- Zucker, A., & Hug, S. T. (2007). A study of the 1:1 laptop program at the Denver school of science & technology online submission. *Science*, 323(5910), 82-85. doi: 10.1126/science.1167705.
- Zucker A., & McGhee R. (2005). *A study of one-to-one computer use in mathematics and science instruction at the secondary level in Henrico county public schools*. (No. 0231147). Washington, DC: SRI International.



## Appendix A

### The Technology Integration Progression Chart

Entry	Developing	Approaching	Ideal/Target
<b>Integrating Technology to Support Instruction: Overview of the Teaching and Learning Process</b>			
<ul style="list-style-type: none"> <li>Instruction is teacher directed. Teacher does not seek out technology resources to enhance learning.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher begins to seek out technology resources to enhance learning.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher begins to experiment with student centered learning activities that incorporate advanced technologies.</li> <li>Teachers use technology to differentiate instruction</li> </ul>	<ul style="list-style-type: none"> <li>Teacher facilitates technology enriched, student-centered learning.</li> </ul>
<ul style="list-style-type: none"> <li>No technology lessons observed.</li> </ul>	<ul style="list-style-type: none"> <li>Technology lessons are independent of content.</li> <li>When technology resources are used, focus is on application only, not integration.</li> </ul>	<ul style="list-style-type: none"> <li>Technology-enhanced lessons are aligned to learning standards.</li> </ul>	<ul style="list-style-type: none"> <li>Lessons and activities are clearly aligned to content learning goals. Strategies aligned to Virginia SOLs and incorporate national technology standards (NETS-S) as described below.</li> </ul>

Entry	Developing	Approaching	Ideal/Target
<b>Integrating Technology to Support Instruction: Organization of the Learning Space</b>			
<ul style="list-style-type: none"> <li>No apparent consideration in organizing/arranging the classroom for use of student laptops.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher is aware of the importance of classroom organization/arrangement to manage student use of technology</li> </ul>	<ul style="list-style-type: none"> <li>Teacher stages room arrangement to best fit instruction.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher dynamically configures room for instruction and transitions are seamless.</li> </ul>
<ul style="list-style-type: none"> <li>Teacher does not use (available) projection equipment.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher occasionally uses available device(s) to project teacher computer.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher uses available device(s) for interactive instruction.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher and students use available projection device for interactive instruction when appropriate.</li> </ul>

Entry	Developing	Approaching	Ideal/Target
<b>Integrating Technology to Support Instruction: Digital Organization</b>			
<ul style="list-style-type: none"> <li>Lack of digital organization. Any organization evident is hard copy</li> </ul>	<ul style="list-style-type: none"> <li>Limited digital organization.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher directed digital organization.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher encourages student created and maintained digital organization systems including electronic calendars, and folders.</li> </ul>
<ul style="list-style-type: none"> <li>Paper and pencil notes</li> <li>Hardcopies handouts</li> <li>No obvious use of digital distribution or collection of documents.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher directed note taking using word processing.</li> <li>Teacher may create multimedia presentations as student notes or for lecture.</li> <li>Teacher uses some simple digital worksheets.</li> <li>Teacher uses available electronic resources to distribute documents to students.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher directed note taking using a variety of skills and resources</li> <li>Teacher uses other forms of digital delivery such as CD, portable hard drive, flash drive and/or email.</li> </ul>	<ul style="list-style-type: none"> <li>Teachers encourage students to select from a variety of technology to organize and summarize material</li> <li>Electronic Resources are used to distribute, collect, and return a variety of digital content.</li> <li>Teacher provides feedback digitally.</li> </ul>

## The Technology Integration Progression Chart

Entry	Developing	Approaching	Ideal/Target
<b>Integrating Technology to Support Student Centered Learning</b>			
<ul style="list-style-type: none"> <li>Student use of technology is optional.</li> <li>Students rely on teacher for dissemination of information.</li> <li>Students engage in face-to-face communication.</li> <li>Students communicate learning through standard written and oral means.</li> </ul>	<ul style="list-style-type: none"> <li>Students use electronic resources that have been selected by the teacher.</li> <li>Students use technology to solve fictitious scenarios.</li> <li>Teacher introduces technology-based cooperative learning strategies (group work).</li> <li>Students work independently to solve problems that involve the use of technology.</li> <li>Students engage in electronic communication that is one-way and synchronous.</li> <li>Students observe teacher demonstrating the use of electronic devices to manipulate static data.</li> <li>Students document learning through word-processed documents, presentations and graphic organizers.</li> <li>Students are provided information regarding the ethical use of technology.</li> </ul>	<ul style="list-style-type: none"> <li>Students use web resources that have been selected and evaluated by the teacher.</li> <li>Students begin to engage in technology-enhanced learning experiences that are open-ended and require higher order thinking skills.</li> <li>Students engage in asynchronous and synchronous electronic communication to gain knowledge and understanding.</li> <li>Students use technology to solve authentic problems.</li> <li>Students communicate ideas through use of video, pictures, images, and/or graphics.</li> <li>Students reference and respond to spreadsheets, databases, digital video, images, blogs, wiki pages, podcasts, interactive PDF's, web pages, video conferences, real-time data, to gather and analyze information.</li> <li>Students use teacher-selected electronic devices to collect, organize, analyze and display real-time data.</li> <li>Students create databases and spreadsheets.</li> <li>Students are aware of the ethical, cultural and societal issues relating to the use of technology.</li> </ul>	<ul style="list-style-type: none"> <li>Students engage in technology-dependent learning that is project-based, using open-ended questions and higher order thinking skills.</li> <li>Students use electronic resources to plan, design and execute solutions to real-world problems.</li> <li>Students effectively evaluate web resources for validity.</li> <li>Students collaborate while using technology to solve authentic problems.</li> <li>Students contribute to and develop electronic products to gain knowledge and demonstrate content mastery.</li> <li>Students communicate ideas through a variety of media.</li> <li>Students use advanced knowledge of software applications to communicate.</li> <li>Students select appropriate electronic devices to gather, organize, analyze and display real time data.</li> <li>Student work demonstrates understanding of ethical, cultural and societal issues regarding technology.</li> </ul>
<b>Entry</b>	<b>Developing</b>	<b>Approaching</b>	<b>Ideal/Target</b>
<b>Integrating Technology to Support Instruction: Use of Electronic Resources for Instruction</b>			
<ul style="list-style-type: none"> <li>Print resources used exclusively.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher uses pre-made technology lessons/materials/templates.</li> <li>Teacher supplements textbook with online content.</li> <li>Teacher uses webpage to post homework and communicate.</li> <li>Teacher uses technology and electronic resources to differentiate instruction.</li> </ul>	<ul style="list-style-type: none"> <li>Textbooks supplement frequent use of technology resources and online content.</li> <li>Teacher incorporates project-based learning.</li> <li>Teacher evaluates electronic resources for appropriateness and effectiveness.</li> <li>Teacher webpage is used for an instructional tool.</li> <li>Teachers begin to develop their own project-based lessons.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher incorporates open-ended questioning and higher order thinking skills in real-world technology-rich learning experiences.</li> <li>Teacher facilitates student collaboration through technology.</li> <li>Teacher instructs students on evaluation of electronic resources and encourages use of all appropriate resources to solve authentic problems.</li> <li>Teachers develop their own electronic resources and lessons for students</li> </ul>
<b>Entry</b>	<b>Developing</b>	<b>Approaching</b>	<b>Ideal/Target</b>
<b>Integrating Technology to Support Instruction: Use of Electronic Resources for Assessment</b>			
<ul style="list-style-type: none"> <li>Assessment is via hard copy.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher uses some pre-made assessment tools that are available with electronic resources like Larson's or Brain Pop.</li> </ul> <p>Teacher may create and print tests using test generation software</p>	<ul style="list-style-type: none"> <li>Teacher uses technology to create, align and administer online assessments formatted in the style of the state tests.</li> <li>Teacher uses electronically delivered products and projects as assessments.</li> <li>Teacher creates and uses rubrics for grading electronic assessments.</li> </ul>	<ul style="list-style-type: none"> <li>Teacher creates, aligns and administers a <i>wide variety</i> of online assessments.</li> <li>Teacher allows students to select their own method to communicate understanding, including through electronic means.</li> <li>Teacher facilitates student development of an electronic portfolio of assignments and projects to assess learning.</li> <li>Teacher uses data from all portfolio assessments to inform instruction.</li> </ul>

## Appendix B

### Participant Letter

Dear \_\_\_\_\_,

My name is Mary Eckert and I am a doctoral candidate working on my dissertation at Virginia Commonwealth University. My dissertation research was conducted in three phases. Phase one involves an on-line survey, phase two involves technology classroom observations, and phase three was focus group interviews. All results will be shared with division staff to inform best practice.

I invite you to take part in my research study by answering an on-line survey; allowing me to observe your classroom technology integration; and participating in a 60 minute focus group.

The primary research question is:

From teachers' perspectives, what effects has a comprehensive, rapid and total one-on-one wireless laptop deployment and technology initiative had on business and marketing high school teachers' technology skills and technology integration over the last eight years?

Additional questions to explore may include:

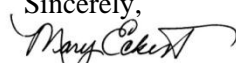
- 1) How has technology (hardware, software) in business and marketing classrooms changed over seven years?
- 2) How has technology affected the business and marketing classrooms' learning environment?

**The results of this survey will be used as part of my dissertation.**

For phase one, you are asked to complete an anonymous online survey. The survey will take approximately 7 – 10 minutes to complete. Participation is completely voluntary.

To take the survey type the following link into your browser's address bar:  
<http://businessandmarketing.surveyconsole.com/>

Thank you for your kind consideration. Please e-mail me with any questions or concerns at mteckert928@verizon.net

Sincerely,  
  
Mary T. Eckert

## **Appendix C**

### **Participants' Professional Profiles**

Alicia holds a Bachelor of Science degree in Business Education and has taught business exclusively in the school district for 23 years. She does not have a Promethean Board® but does have a LCD projector that she uses on a regular basis. Alicia's site-based administration does not require the use of School Space; consequently, she does not utilize it. She has received school based technology training in Elluminate® and instructional technology standards for instructional personnel. In order to teach her course curriculum, Alicia has taken one college level course, Basic Web Design.

Annie holds a Master of Education degree in Business General Office Procedures and Stenography and has taught a total of 21 years with 15 years of service in the school district. Annie does not have a permanent classroom but does have access to a Promethean Board®. She has been trained on the interactive whiteboard and only uses it occasionally. Annie's site-based administration requires the use of School Space, so she does use it. She has taken one college level course in Microsoft Office suite in order to teach her curriculum.

Bridgett holds a Bachelor of Science degree in Business Education and has taught business for 22 years with 12 years in the school district. Bridget does not have a Promethean Board® but she does have a LCD projector that she uses on a regular basis. Bridget's site-based administration does require the use of School Space; consequently, she does utilize it. She has received school based technology training in Quia. In order to stay current with her content area, Bridgett has taken two college-level courses, Microsoft Office and Webpage Design.

Dee Dee is a national board certified teacher who holds a Bachelor of Science degree in Business Education and Stenography. She has taught business and information technology a total of 29 years with 27 years of service in the school district. Dee Dee has access to a Promethean Board® and an LCD projector that she uses on a daily basis. Dee Dee maintains a teacher website, although her site-based administration does not require her to do so. Her site-based administration does require the use of School Space, so she does utilize it. She has received school based technology training in Quia, Promethean Board®, and Elluminate®. In order to teach her curriculum, Dee Dee has taken one college level course in Information Technology Fundamentals.

Eileen is a national board certified teacher who holds a Bachelor of Science degree in Business Education and a Master of Education degree in Director of Education. She has taught business and information technology exclusively in the school district for 30 years. Eileen has a Promethean Board® and an LCD projector. Eileen does not use the Promethean Board® because of software issues. Eileen maintains a teacher website and, although Eileen's site-based administration does not require the use of School Space, so she does utilize it. To enhance her instruction she has received school-based technology training in Quia and the Promethean Board®. Eileen has taken classes in Oracle to stay current with her curriculum needs.

Ellie is a national board certified teacher who holds a Bachelor of Science degree in Business Education with an endorsement in general office procedures, general office processes, and teacher as leader. She has taught business and information technology for a total of 19 years with 15 years of service in the school district. Ellie has access to a Promethean Board® and an LCD projector that she uses on a daily basis. Ellie does not maintain a teacher website. Her

site-based administration does require the use of School Space, so she does utilize it. To enhance her instruction, she has received school-based technology training in Quia, Promethean Board®, and Elluminate®. Ellie has received additional technology training in CanDo (a CTE specific online database system), Certified Internet Webmaster (CIW), and SAM 2003/2007. To teach her curriculum, Ellie has taken two college-level courses, one in Information Technology Fundamentals and the other web design. She holds two industry certifications, Internet and computing core certification (IC³®) and Microsoft Office Specialist (MOS).

Jake holds a Bachelor of Science degree in Business Education. Jake has taught business exclusively in the school district for 18 years. He does not have a Promethean Board® but does have a LCD projector that he uses on a regular basis. Jake maintains a teacher website. Jake's site-based administration does not require the use of School Space, so he does not utilize it. To enhance his instruction, he has received school based technology training in Quia and Elluminate®. Jake holds industry certifications in Internet and computing core certification (IC³®) and, Microsoft Office Specialist (MOS).

Louise is a national board certified teacher (NBCT) who has a Master of Education degree in Business Education with an endorsement in general operations, general processing and stenography. She has taught a total of 16 years with 13 years service in the school district. Louise does not have access to a Promethean Board®, but she has access to an LCD projector that she uses daily. Her site-based administration does not require her to use School Space; therefore, she does not utilize it. Louise does not maintain a website for her students. To enhance her instruction, Louise has received school based technology training in Quia, Audacity, and Elluminate®. Louise has not taken a college-level technology course in the last eight years;

however, she holds two industry certifications, Internet and computing core certification (IC<sup>3</sup>®) and Microsoft Office Specialist (MOS).

Lucy holds a Bachelor of Science degree in Business Education and has taught a total of 28 years with 26 years of service in school district. Lucy has not been trained on the use of a Promethean Board®, she does have one in her classroom. She does have a LCD projector that she uses on a regular basis. Lucy's site-based administration does require the use of School Space; consequently, she does utilize it. In order to enhance her instruction she has he has received school-based technology training in Quia and has taken one college-level course, called Tools for Teaching.

Maggie holds a Bachelor of Science degree in Business Education and has taught business exclusively in school district for 31 years. Although Maggie has been trained on the use of a Promethean Board®, she does not have one in her classroom but does have a LCD projector that she uses on a regular basis. Maggie's site-based administration does require the use of School Space, consequently she does utilize it. She has received school-based technology training in Quia, Promethean Board®, and Elluminate®. In order to stay current with her curriculum Maggie has taken school-based classes in Dreamweaver, Desktop Multimedia, Flash, and web design and has taken one college-level course, Information Technology Fundamentals.

Rita holds a Bachelor of Science degree in Business Education and stenography and is currently pursuing a Master of Education degree in Curriculum and Instruction with an endorsement in instructional technology. She has taught business education a total of 18 years with 13 years of service in the school district. Rita has a Promethean Board® and an LCD projector that she uses on a daily basis. Rita maintains a teacher website. Her site-based administration does require the use of School Space, so she does utilize it. In order to enhance

her teaching, she has received school-based technology training in Quia, Promethean Board®, and Elluminate®. To further enhance her teaching Rita has taken several college level technology classes as part of her master's degree program. The classes have taught her how to use technology such as voice threads, wiki pages, and Audacity. She holds an industry certification in Microsoft Office Specialist (MOS).

Rose holds a Bachelor of Science degree in Business Education and has taught business exclusively in school district for 23 years. She does have a Promethean Board® and a LCD projector. She has not been trained to use the Promethean Board® so she does not use it. She does, however, use the LCD projector on a regular basis. Rose's site-based administration does not require the use of School Space; consequently, she does not utilize it.

Robbie holds a Bachelor of Science degree and has taught marketing a total of 22 years with 18 years of service in the school district. Robbie does not have a Promethean Board® but does have a LCD projector that he uses on a regular basis. Robbie does not maintain a teacher website. Robbie's site-based administration does require the use of School Space; consequently, he does utilize it. Robbie has received school-based technology training in Quia. In order to teach his curriculum, Robbie has taken one college level course in Internet commerce. He holds one industry certifications in customer service.

Sterling holds a Bachelor of Science degree in Marketing and Business and Information Technology. Sterling has taught business exclusively in the school district for 16 years. She does not have a Promethean Board® but does have a LCD projector that she uses on a regular basis. Sterling's site-based administration does not require the use of School Space; consequently she does not utilize it. To enhance her instruction she has received school based technology training in Quia, and Elluminate® and is currently pursuing a Master in Education degree in Curriculum



and Instruction with an endorsement in instructional technology. Her additional college-level education is designed to teach her how to integrate technology into instruction to enhance the students' learning experience.

Taylor holds a Bachelor of Science degree in Marketing and a Master of Education degree with an endorsement in Administration and Supervision pre-k12. Taylor has taught marketing exclusively in the school district for 31 years. She does not have a Promethean Board® but does have a LCD projector that she uses on a regular basis. Taylor maintains a teacher website and, although Taylor's site-based administration does not require the use of School Space, she does utilize it. She has received school-based technology training in Quia.

Thelma has a Bachelor of Science degree in Business Education. She has taught a total of 18 years with 14 years service in the school district. Thelma does not have access to a Promethean Board® or a LCD projector. Her site-based administration does not require her to use School Space; therefore, she does not utilize it. Thelma does maintain a website for her students. Thelma has received school-based technology training in Quia and eClass. To teacher curriculum Thelma has taken one college-level course in Information Technology Fundamentals. She holds two industry certifications, Internet and computing core certification (IC³®) and Microsoft Office Specialist (MOS).

Tori holds a Bachelor of Science degree and has taught marketing exclusively in the school district for 24 years. Tori does not have a Promethean Board® but does have a LCD projector that she uses on a regular basis. Tori maintains a teacher website. Tori's site-based administration does not require the use of School Space; consequently she does not utilize it.

Wally holds a Bachelor of Science degree in Business Education and has taught business exclusively in school district for 18 years. She does not have a Promethean Board® but does

have a LCD projector that she uses on a regular basis. Wally's site-based administration does require the use of School Space; consequently, she does utilize it. She has received school-based technology training in Quia.

## Appendix D

### Survey

Hello:

I am conducting a study as a doctoral candidate to evaluate the affect of the one-to-one laptop initiative on the business and marketing teachers' instruction from its inception through its eighth year of implementation.

You are invited to participate in this Technology Integration survey. Eighteen high school business and marketing teachers are asked to complete this survey. It will take approximately 10 minutes to complete.

Your participation in this study is completely voluntary. There are no foreseeable risks associated with this project. However, if you feel uncomfortable answering any questions, you can withdraw from the survey at any point. It is very important to learn your opinions.

Your survey responses will be strictly confidential. Your information was coded and will remain confidential. This study is voluntary and conducted as part of a dissertation project and it is not being conducted by the school district. However, the results from the study will be shared with the staff to inform best practice. If you have questions at any time about the survey or the procedures, you may contact Mary Eckert at 364-5505 or by email at the email address specified below.

Thank you very much for your time and support. Please start with the survey now by clicking on the **Continue** button below.

Continue

---

Please contact Mary Eckert at mteckert928@verizon.net with any questions regarding this survey.

**How many years have you taught (included the current year)?**

---

**How many years have you spent teaching in the school district (included the current year)?**

**Please select your age range**

- ☐ 28 - 32
  - ☐ 33 – 39
  - ☐ 40 – 45
  - ☐ 46 – 49
  - ☐ 50 – 55
  - ☐ 56+
- 

**Please select your gender**

- ☐ Male
  - ☐ Female
- 

**Please select the statement that best describes you.**

- ☐ Most or all of the classes I teach are marketing (which may include advanced marketing, SERM, or fashion marketing).
  - ☐ Most or all of the classes I teach are keyboarding applications, keyboarding/WP, or Intro to Computer Applications.
  - ☐ Most or all of the classes I teach are computer-based (EX: CIS, ACIS, DMWT, Programming).
  - ☐ Most or all of the *business* classes I teach are lecture-based (EX: accounting, business law, business management).
  - ☐ I teach an equal number of business and marketing classes.
- 

**For the following questions select a level from 1 -7 that best describes your particular classroom situation.**

**Select the statement that best describes the level of your organization of the learning space.**

- ☐ 1. I do not consider the organization or arrangement of my classroom for the use of student laptops.
  - ☐ 2.
  - ☐ 3. I am aware of the importance of classroom organization and arrangement to manage student use of technology
  - ☐ 4.
  - ☐ 5. I stage my room arrangement to best fit instruction.
  - ☐ 6.
  - ☐ 7. I dynamically configure my room for instruction so that transitions are seamless.
-

**Select the statement that best describes the level of your organization of the learning space.**

- ☐ 1. I do not use (available) projection equipment.
  - ☐ 2.
  - ☐ 3. I occasionally use available device(s) to project teacher computer
  - ☐ 4.
  - ☐ 5. I use available device(s) for interactive instruction
  - ☐ 6.
  - ☐ 7. My students and I use available projection device(s) for interactive instruction when appropriate.
- 

**Select the statement that best describes your digital organization.**

- ☐ 1. I organize all of my files, documents, tests, quizzes in a traditional file cabinet.
  - ☐ 2.
  - ☐ 3. I organize many of my files, documents, tests and quizzes in a traditional file cabinet and some electronically
  - ☐ 4.
  - ☐ 5. I organize my files, documents, tests and quizzes electronically.
  - ☐ 6.
  - ☐ 7. I encourage my students to create and maintain digital organizational systems including electronic calendars and folders.
- 

**Select the statement that best describes your digital organization.**

- ☐ 1. My students take paper and pencil notes. I distribute hard copies of all class documents.
  - ☐ 2.
  - ☐ 3. My students use word processing to take notes. I use available electronic resources to distribute documents to students.
  - ☐ 4.
  - ☐ 5. I use a variety of forms of digital delivery such as CDs, portable hard drives, flash drives and/or email.
  - ☐ 6.
  - ☐ 7. Electronic resources are used to distribute, collect, and return a variety of digital content. I provide feedback digitally.
- 

**Select the statement that best describes your use of electronic resources for instruction.**

- ☐ 1. I use print resources exclusively.
  - ☐ 2.
  - ☐ 3. I use pre-made technology lessons/materials/templates. I supplement textbook material with online content.
  - ☐ 4.
  - ☐ 5. I frequently supplement textbook materials with technology resources and online content. ~and/or ~ I incorporate project-based learning.
  - ☐ 6.
  - ☐ 7. I develop my own electronic resources and lessons as well as incorporate open-ended questioning and higher order skills in real-world technology-rich learning experiences.
-

**Select the statement that best describes your use of electronic resources for assessment.**

- ☐ 1. I assess via hard copy.
  - ☐ 2.
  - ☐ 3. I use pre-made assessment tools that are available with textbook publishers' electronic resources.
  - ☐ 4.
  - ☐ 5. I use technology to create, align and administer online assessments. I create and use rubrics for grading electronic assessments.
  - ☐ 6.
  - ☐ 7. I create, align and administer a wide variety of online assessments. I facilitate student development of an electronic portfolio assignments and projects to assess learning.
- 

**Select the statement that best describes your support of student centered learning. In my classroom:**

- ☐ 1. Students use technology is optional. Students communicate learning through standard written and oral means.
  - ☐ 2.
  - ☐ 3. Students use electronic resources that I select. I demonstrate the use of electronic devices to manipulate static data. Students document learning through word-processing documents, presentations and graphic organizers.
  - ☐ 4.
  - ☐ 5. Students engage in asynchronous and synchronous electronic communication to gain knowledge and understanding. ~and/or~ Students reference and respond to electronic data such as spreadsheets, databases, digital video, images, blogs, podcasts, interactive PDFs, web pages, video conferencing and real-time data to gather and analyze information.
  - ☐ 6.
  - ☐ 7. Students use electronic resources to plan, design and execute solutions to real-world problems. Students engage in technology-dependent learning that is project-based, using open-ended questions and higher order thinking skills.
- 

***Thank you for agreeing to participate in this survey.***

Please contact Mary Eckert at mteckert928@verizon.net with any questions regarding this survey.

---

I choose not to participate.

**Continue**

## Appendix E

### Participants' Perception of Their Technology Integration Level Based on the Technology Integration Progression Chart

TIPC Standard	Survey Statement	N	%
Select the statement that best describes the level of your organization of the learning space:	1. I do not consider the organization or arrangement of my classroom for the use of student laptops.	1	5.6
	2.	0	0
	3. I am aware of the importance of classroom organization and arrangement to manage student use of technology.	4	22.2
	4.	0	0
	5. I stage my room arrangement to best fit instruction.	7	38.9
	6.	3	16.7
	7. I dynamically configure my room for instruction so that transitions are seamless.	3	16.7
Select the statement that best describes your organization of the learning space:	1. I do not use (available) projection equipment.	0	0
	2.	0	0
	3. I occasionally use available device(s) to project teacher computer.	1	5.8
	4.	1	5.8
	5. I use available device(s) for interactive instruction.	6	35.3
	6.	1	5.9
	7. My students and I use available projective device(s) for interactive instruction when appropriate.	8	47.1

TIPC Standard	Survey Statement	N	%
Select the statement that best describes digital organization:	1. I organize all of my files, documents, tests, quizzes in a traditional file cabinet.	0	0.0
	2.	0	0.0
	3. I organize some of my files, documents, tests and quizzes in a traditional file cabinet and some electronically.	6	33.3
	4.	2	11.1
	5. I organize my files, documents, tests and quizzes electronically.	5	27.8
	6.	3	16.7
	7. I encourage my students to create and maintain digital organizational systems, including electronic calendars and folders.	2	11.1
Select the statement that best describes your digital organization:	1. My students take paper and pencil notes. I distribute hard copies of all class documents.	0	0.0
	2.	1	5.6
	3. My students use word processing to take notes. I use available electronic resources to distribute documents to students.	6	33.3
	4.	3	16.7
	5. I use a variety of forms of digital delivery such as CD, portable hard drive, flash drive and/or email.	1	5.6
	6.	4	22.2
	7. Electronic resources are used to distribute, collect and return a variety of digital content. I provide feedback digitally.	3	16.7



TIPC Standard	Survey Statement	N	%
Select the statement that best describes your use of electronic resources for instruction:	1. I use print resources exclusively.	0	0.0
	2.	0	0.0
	3. I use pre-made technology lessons/materials/templates. I supplement textbook material with online content.	0	0.0
	4.	4	22.2
	5. I frequently supplement textbook materials with technology resources and online content. And/or I incorporate project-based learning.	8	44.4
	6.	4	22.2
	7. I develop my own electronic resources and lessons as well as incorporate open-ended questioning and higher order thinking skills in real-world, technology-rich learning experiences.	2	11.1
Select the statement that best describes your use of electronic resources for instruction:	1. I assess via hard copy.	1	5.6
	2.	0	0.0
	3. I use pre-made assessment tools that are available with textbook publishers' electronic resources.	2	11.1
	4.	5	27.8
	5. I use technology to create, align and administer online assessments. I create and use rubrics for grading electronic assessments.	5	27.8
	6.	4	22.2
	7. I create, align and administer a wide variety of online assessments. I facilitate student development of an electronic portfolio of assignments and projects to assess learning.	1	5.6

TIPC Standard	Survey Statement	N	%
Select the statement that best describes your support of student-centered learning. In my classroom:	1. Students use of technology is optional. Students communicate learning through standard written and oral means.	0	0.0
	2.	1	5.6
	3. Students use electronic resources that I select. I demonstrate the use of electronic devices to manipulate static data. Students document learning through word processing documents, presentations and graphic organizers.	5	27.8
	4.	5	27.8
	5. Students engage in asynchronous and synchronous electronic communication to gain knowledge and understanding. And/or students reference and respond to electric data such as spreadsheets, databases, digital video, images, blogs, wiki pages, podcasts, interactive PDFs, web pages, video conferencing and real-time data to gather and analyze information.	1	5.6
	6.	3	16.7
	7. Students use electronic resources to plan, design and execute solutions to real-world problems. Students engage in technology-dependent learning that is project-based, using open-ended questions and higher order thinking skills.	3	16.7

1 = Entry level; 2 = Between entry and developing level; 3 = Developing level; 4 = Between developing and approaching level; 5 = Approaching level; 6 = Between approaching and idea level; and 7 = Ideal level.

## Appendix F

### Observation Form

# Teacher Observed: \_\_\_\_\_ School: \_\_\_\_\_

Date: \_\_\_\_\_ Observer: \_\_\_\_\_

Content: \_\_\_\_\_ Grade: \_\_\_\_\_ Course: \_\_\_\_\_

Setting: ☐ classroom without desktop computers ☐ classroom with desktop computers

**Technology:**

- ☐ writing/word processing ☐ graphics/drawing ☐ simulations
- ☐ computer: ☐ slide show/presentations ☐ webbing/outlining ☐ tutorial
- ☐ hypermedia ☐ database ☐ drill & practice
- ☐ graphing ☐ spreadsheet ☐ other

- ☐ Internet: ☐ research ☐ webquest ☐ presentations
- ☐ online course materials ☐ webpage creation ☐ email/keypals
- ☐ electronic field trips ☐ video conferencing ☐ other

- ☐ video: ☐ creating/editing ☐ original presentations ☐ distance learning

☐ other:

### Ratings:

- |                 |  |
|-----------------|--|
| E= Exemplary    | This component was observed and was judged to be of <i>high</i> quality.         |
| A= Acceptable   | This component was observed and was judged to be of <i>satisfactory</i> quality. |
| I= Ineffective  | This component was observed and was judged to be of <i>inadequate</i> quality.   |
| N= Not observed | This component was <i>not</i> observed.  |

Level of Implementation	Comments	Rating			
		E	A	I	N
Teacher planning and organization of the use of technology was clearly evident.					
Computer activities demonstrated a natural application and a logical connection to the curriculum.					
The teacher monitored student work at the computer and offered assistance when needed.					
Lesson objectives were clear.					
There was evidence that the teacher is moving from traditional teacher-directed classroom to an interactive student-centered classroom.					

The teacher promoted a collaborative, cooperative learning environment.					
--	--	--	--	--	--

Brief description of how technology was used in the learning experience:

## Appendix G

### Permission to Conduct Research

#### Department of Research & Planning

April 29, 2009

Mary T. Eckert  
6003 Bishops Gate Court  
Glen Allen, Virginia 23059

Dear Mrs. Eckert:

The Department of Research and Planning has reviewed and approved your research study entitled "Eight Years of Ubiquitous Technology Access and Digital Curricula: Business and Information Technology and Marketing High School Teachers' Perspectives". As planned, you may conduct your study during the fall 2009 semester; however, please contact Research and Planning prior to beginning your data collection activities.

Although your study has been approved, participation by individuals and schools is completely voluntary. Prior to beginning your study, you need to contact the principals and teachers of the requested schools to inform them of the study and gather their support in assisting you with your data collection activities. Reports and publications generated from this study should not identify the individuals, schools, or the division and all research materials should accurately represent the party conducting the study. If there are changes to the methods or materials that you plan to use, you must submit the changes to our office for review prior to proceeding. If you are affiliated with an organization with an Institutional Review Board (IRB), an IRB approval letter must be on file in our office prior to beginning the study. It is our expectation that you submit a final report upon completion of the study to the Department of Research and Planning. Please contact Tiffany Hinton, Educational Specialist – Research who will assist you in the process of beginning your research activities.

Thank you for your interest in our school district.

Sincerely,



Penny Blumenthal, Ph.D. Director of Research and Planning

## Appendix H

### Teacher Informed Consent Agreement

**Please read and sign this consent agreement  
before you decide to participate in the study.**

**Study Title:** Eight years of ubiquitous technology access and digital curricula: Business and Information Technology and marketing high school teachers' perspectives.

**Purpose of the research:** The purpose of the study is to determine the affect a wide-scale technology initiative has had on business and marketing high school teachers' technology skills and technology integration over the last eight years.

**Your responsibility as part of the study:** Each participant will complete an on-line survey; allow the researcher to observe four times to document classroom technology integration; and participate in a 60-minute focus group. The focus group discussion was recorded and transcribed.

**Risks:** There is no apparent risk associated with this study.

**Benefits:** There are no direct benefits to the participants. The study may indicate the affect the eight years of the Teaching and Learning Initiative has had on teachers' technology skills and integration.

**Confidentiality:** The information gathered will remain confidential. The on-line survey was submitted anonymously, the observational data was coded to maintain confidentiality and the focus group participants use pseudonyms for anonymity. The focus group sessions will be digitally recorded and transcribed without identifying references to the participants. Once the data is verified by the participants, the digital recordings were destroyed. Analysis of the transcribed data was done solely by the researcher. This study is being conducted as part of a dissertation project and it is not being conducted for the school district; however, the results of the study will be shared with division staff to inform best practice.

**Voluntary participation:** Teachers' participation is completely voluntary.

**Right to withdraw from study:** Teachers may withdraw from the study at any time.

**How to withdraw from study:** Teachers may withdraw at any time by contacting the researcher.

**Remuneration:** The teacher will not be compensated for participating in the study.

**Who to contact with questions:**

Mary Eckert  
6003 Bishops Gate Court  
Glen Allen, Virginia 23059  
Telephone: 804-364-5505  
E-mail: mteckert928@verizon.net

**Agreement:** I agree to participate in the research study described above.

Name (Print)\_\_\_\_\_Date\_\_\_\_\_

Signature: \_\_\_\_\_Date\_\_\_\_\_

*You will receive a copy of this form for your records. Focus group protocols are attached.*

## Focus Group Protocol

1. The focus group was conducted from 4 p.m. to 5:30 p.m. in a business or marketing room.
2. Business and marketing teachers was seated at a large table or at individual tables forming a circle.
3. The tape recorder was situated in the center of the teachers to allow for optimum recording.
4. The researcher will sit with the participants.
5. The focus group atmosphere was informal.
6. The rules of the focus group session was submitted to the teacher-participants prior to the session and attached to the consent form.
  - Participation is voluntary.
  - Participants may withdraw from session at anytime.
  - Pseudonyms will be used for all participants to ensure anonymity.
  - Participants may ask questions to the researcher for clarity.
  - Participants may choose not to answer questions.
  - Participants may share classroom technology experiences.

## Interview Questions

The researcher will gather and analyze the on-line survey and observational data to develop focus group questions that will be used to expand on and clarify the data.

The principal guiding question for this study is the following:

From teachers' perspectives, what affect has a comprehensive, rapid and total one-on-one wireless laptop deployment and technology initiative had on business and marketing high school teachers' technology skills and technology integration over the last eight years?

Additional questions to explore may be included:

- 1) How has technology (hardware, software) in business and marketing classrooms changed over seven years?
- 2) How has the one-to-one initiative affected the business and marketing teachers' technology



## **Vita**

Mary Theresa Eckert was born on September 28, 1955, in Berlin, Germany and is an American citizen. She graduated from W. T. Woodson High School, Fairfax, Virginia in 1973. She received her Bachelor of Science in marketing education and basic business from Old Dominion University, Norfolk, Virginia in 1977. She taught marketing for 16 years and subsequently has worked as a business and marketing curriculum specialist for seven years in a large school district. She received a Master of Education from Virginia Commonwealth University, Richmond, Virginia in 2005.

Mary's professional experiences prepared her for this study. Mary's last year in the classroom was the first year of the largest one-to-one laptop initiative in the country: 2001-2002. In August 2002, Mary became the business and marketing specialist for 49 nine teachers distributed among seven comprehensive high schools, two technical centers, one alternative high school and eight middle schools in a large school district. She has experienced seven of the eight years of the one-to-one laptop initiative as an administrator.